

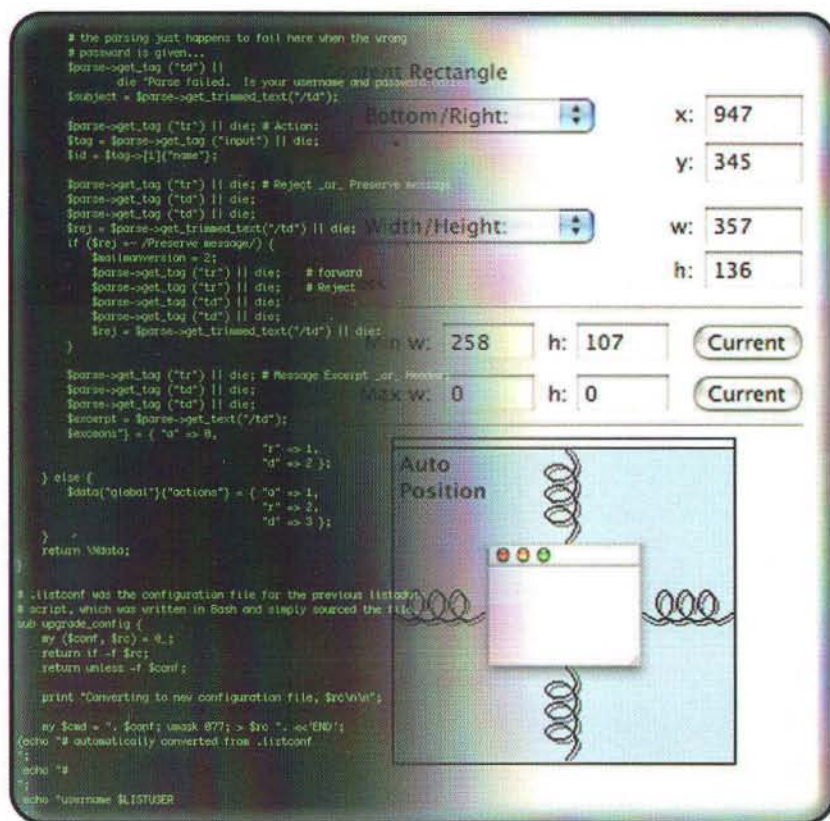
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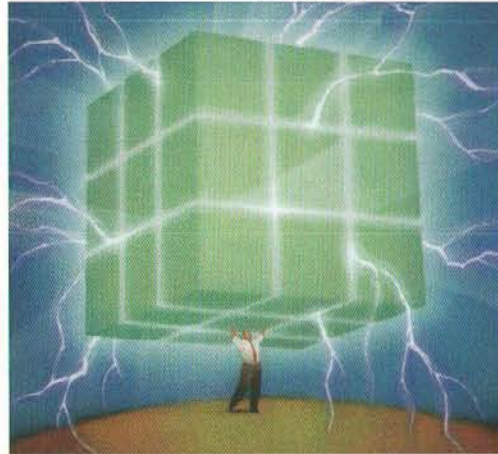
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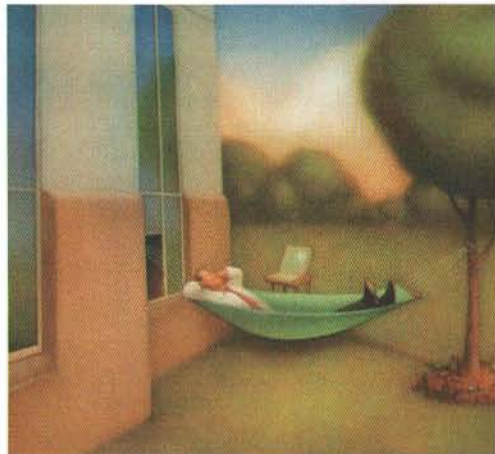
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APPLESCRIPT ESSENTIALS

by Benjamin S. Waldie

Introduction to Scripting Photoshop

Over the past several months, we have focused on scriptable ways to interact with remote directories using applications like Fetch, Transmit, Cyberduck, and more. Now, we're going to switch gears a bit, and begin to discuss something that pertains more to the creative side of the Macintosh market. We're going to begin looking at scriptable graphics programs. This month's column will provide an introduction to scripting Photoshop, the professional-level image editing application from Adobe.

First, a bit of history. Interestingly, Photoshop did not support AppleScript automation natively until version 7. Prior to this, however, users were able to automate Photoshop 5 and 6 with the use of PhotoScripter, a third-party plug-in from Main Event Software <<http://www.mainevent.com/>>. With the release of Photoshop 7, although Photoshop now supported AppleScript, this support was not installed by default. Rather, users were required to run a second installer from Adobe, in order to add scripting support. Since that time, Photoshop's scripting support has continued to grow with each new release, as the application implements new features and options. Today, Photoshop's scripting support is installed automatically, and has become a vital part of countless users' automated workflows.

Before we get started with writing code, I should mention that all of the examples in this month's column were written and tested with Photoshop CS2, version 9.0. If you are using a different version of Photoshop, please be aware that certain terminology may differ from that which I am using. In order to ensure that you are using the proper terminology, be sure to consult Photoshop's AppleScript dictionary.

Benefits of Scripting Photoshop

Regular Photoshop users often question the need for using AppleScript to drive Photoshop, since many automation technologies are actually built into the application itself. Photoshop's built-in **actions** palette will allow users to record manual tasks, to be triggered later at a click of the mouse in order

to automate time-consuming and repetitive processes. Photoshop even contains a batch capability, which can allow users to automatically process complete folders full of files at once.

Yet, AppleScript automation of Photoshop has many benefits. For one, Photoshop actions don't contain logic, i.e. if this situation occurs, then do this one thing, if this other situation occurs, then do this other thing. AppleScripts, on the other hand, can be written to analyze situations, and take different courses of action based on situations that are encountered during processing. Furthermore, an AppleScript *can* be written to trigger Photoshop actions, making it possible to utilize a combination of AppleScript and built-in recorded actions in order to achieve more complex types of automation. Another thing that AppleScript can do, which Photoshop's built-in automation cannot do, is interact with other applications on your machine. AppleScripts, for example, can be written to do things such as go into QuarkXPress, extract a list of images, open those images in Photoshop, process them, and import them into Quark again.

As you can see, there are a number of benefits to using AppleScript to drive Photoshop. Now, let's start writing some code.

Getting Started

Opening Images

When scripting Photoshop, one of the first things that you will probably want to do is open an image. This can be done by using the open command. For example:

```
set theImage to choose file with prompt "Please select an  
image file:"  
tell application "Adobe Photoshop CS2"  
    open theImage  
end tell
```

When opening images in Photoshop via AppleScript, one thing to keep in mind is that in certain circumstances, dialogs may be displayed, requesting user input. Figure 1 shows an example of a dialog that could be displayed when attempting to open an EPS file.

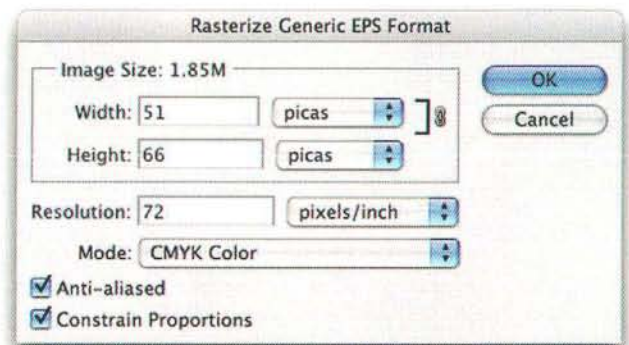


Figure 1. A Photoshop Open Dialog Window

If a dialog is displayed in Photoshop when attempting to open an image with AppleScript, this can actually cause your

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script to hang, as it will be waiting for a reply from Photoshop indicating that the document was successfully opened. With a dialog opened in Photoshop, this reply will never come, and your script will eventually time out. To try to ensure that this type of situation does not occur, it is usually a good idea to utilize the showing dialogs parameter of the open command. This parameter may be used to prevent dialogs from being displayed when opening a file. For example:

```
tell application "Adobe Photoshop CS2"
    open theImage showing dialogs never
end tell
```

Although they may appear when opening problematic files, dialogs are usually displayed during the open process when attempting to open certain types of files, such as EPS files, as we have seen above, PDF files, or Camera RAW files. The reason for this is because Photoshop will allow you to specify various options for how the file is handled as it is opened. Suppose you want to open a multi-page PDF, for example. To do so, you would need to indicate to Photoshop which page of the PDF to display. You may want to specify other options as well, such as resolution.

Just as in manual processing, when writing a script that will open a file, you may not always want to bypass open options for certain types of files. Rather, you may want to specify the options that should be used. To do this, you may use the with options parameter of the open command, and specify the open options for the type of file being opened. A list of scriptable open options can be found in the *Open Formats Suite* of Photoshop's AppleScript dictionary. See figure 2.

The following example code demonstrates the proper usage of the open command, while specifying options for opening an EPS file.

```
set theImage to choose file with prompt "Please select an EPS file:"
tell application "Adobe Photoshop CS2"
    open theImage with options {class:EPS open options,
```

```
    constrain proportions:false, use antialias:false, mode:RGB,
    resolution:300} showing dialogs never
end tell
```

Modifying Application Settings

Before we begin working with opened images in Photoshop, I want to mention that many of Photoshop's preferences are accessible with AppleScript. These settings are accessible via the settings property of Photoshop's application class.

One such modifiable setting is Photoshop's unit of measurement, i.e. pixels, inches, centimeters, etc. You cannot assume that the user running your script is using the same units of measurement that you are. Since many scriptable image manipulation techniques in Photoshop require that you provide unit values, it is necessary to ensure that the correct unit type is being used. For example, suppose you have written a script that will resize an image to 800 x 600 pixels. If Photoshop's units of measurement were set to inches, you would end up with one extremely large resized image.

The following example code demonstrates how you could go about changing Photoshop's units of measurement to the type required by your script, in this case, pixels.

```
tell application
    "Adobe Photoshop CS2"
        set ruler units of
        settings to pixel
        units
    end tell
```

Working with Images

Now that you know how to open an image in Photoshop, you will likely want to begin processing it. To do

so, you will need to reference the image in some way. This is done via the document class. Unfortunately, Photoshop doesn't subscribe to the common front to back numeric ordering scheme that most applications do. In other words, as you will find, document 1 will not always be the front document. Because of this, you will probably want to refer to a document by name. For example:

```
tell application "Adobe Photoshop CS2"
    tell document "My Document.eps"
        -- Do something
    end tell
end tell
```

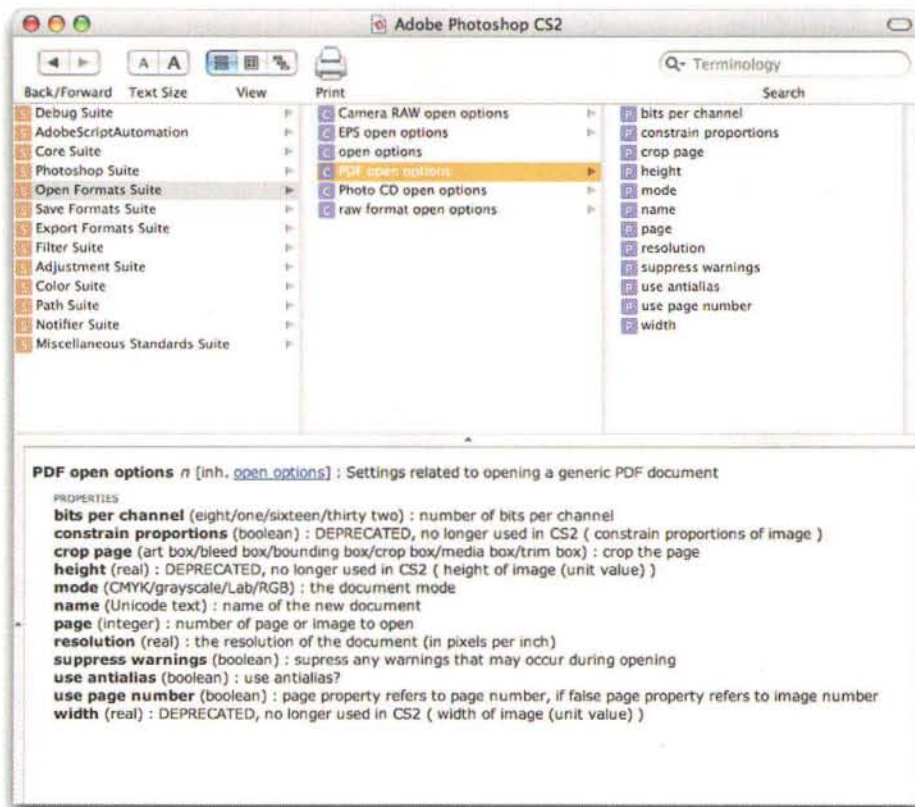


Figure 2. PDF Open Options



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That said, if you only have one document opened, then it is safe to refer to the document numerically. For example:

```
tell application "Adobe Photoshop CS2"
  tell document 1
    -- Do something
  end tell
end tell
```

Accessing the Current Image Document

The open command in Photoshop does not produce a result, such as a reference to the newly opened document. Therefore, after opening a document, you will probably want to retain a reference to it. Assuming that the newly opened document is the front document, which it should be, you can retrieve a reference to it by accessing the current document property of the application class. For example:

```
tell application "Adobe Photoshop CS2"
  set theDocument to current document
end tell
-> document "My Document.eps" of application "Adobe Photoshop CS2"
```

Accessing Image Document Properties

In Photoshop, documents possess a wide variety of properties, many of which are read only. Regardless, utilizing document properties is an important part of scripting. For example, you might want to retrieve the height, width, and resolution of a document, in order to determine whether the document needs to be resized, cropped, or otherwise.

The following example code demonstrates how to retrieve the height of a document. Notice that its result is returned using the current unit of measurement, which, in this case, is pixels.

```
tell application "Adobe Photoshop CS2"
  tell theDocument
    height
  end tell
end tell
-> 3300.0
```

To retrieve the width of a document, access its width property. For example:

```
tell application "Adobe Photoshop CS2"
  tell theDocument
    width
  end tell
end tell
-> 2550.0
```

It is also possible to dynamically convert unit of measurement values to the desired type. For example, the following code will retrieve the width of a document, in inches, regardless of Photoshop's current units of measurement setting.

```
tell application "Adobe Photoshop CS2"
  tell theDocument
    width as inches
  end tell
end tell
-> 8.5
```

To retrieve the resolution of a document, you may access its resolution property, as shown in the example code below.

```
tell application "Adobe Photoshop CS2"
  tell theDocument
    resolution
  end tell
end tell
-> 300.0
```

We have just scratched the surface regarding dealing with document properties. Documents possess many other properties, which I encourage you to explore further in Photoshop's AppleScript dictionary.

Accessing File Info

In Photoshop, documents may also possess what is known as file information. This information, once applied, will stay with many types of files, once saved, and may be extracted or displayed by other applications. File information could be a document author, copyright information, a description, etc.

A document's file information may be modified via AppleScript. This is done with the use of the info property of the document class. The following example code will apply an author name, URL, and copyright information to the file information of a document.

```
tell application "Adobe Photoshop CS2"
  tell theDocument
    tell info
      set author to "Ben Waldie"
      set owner url to "http://www.automatedworkflows.com"
      set copyrighted to copyrighted work
      set copyright notice to "Copyright 2006, Ben Waldie, Automated Workflows, LLC"
    end tell
  end tell
end tell
```

In Photoshop, file information for a document may be viewed by selecting **File Info...** from the **File** menu. Figure 3 shows an example of the file information window for a document.

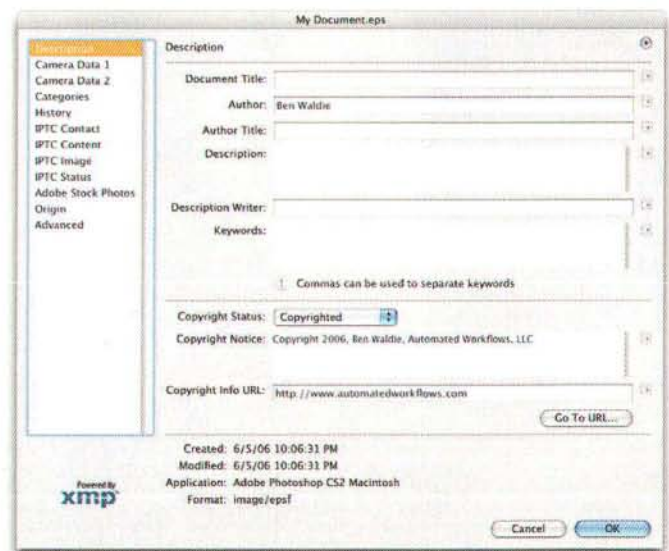


Figure 3. File Info for a Document

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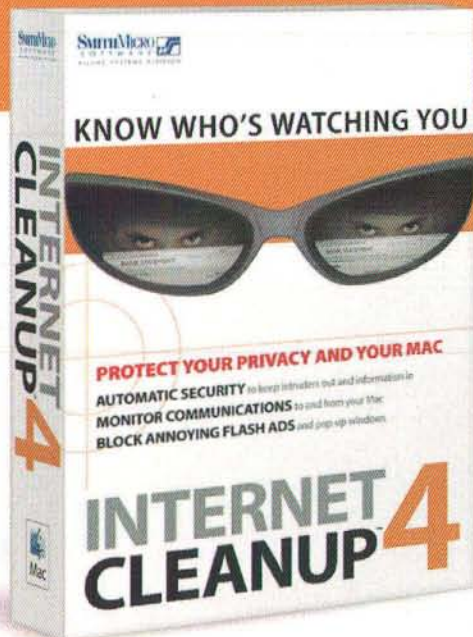
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It is also possible to retrieve the file information of a document via AppleScript. The following code demonstrates how to retrieve the author of a document from its file information.

```
tell application "Adobe Photoshop CS2"
  tell theDocument
    author of info
  end tell
end tell
-> "Ben Waldie"
```

Manipulating Images

Most Photoshop scripters will not simply want to access document properties and file information. Rather, they will want to get started with manipulating images. Photoshop's AppleScript dictionary contains numerous commands for performing various types of image manipulations. We'll explore a few of these now.

Resizing Image Documents

The `resize` command, which can be found in the *Photoshop Suite* of Photoshop's dictionary, may be used to change the height, width, and resolution of a document. This command is utilized in the following manner:

```
tell application "Adobe Photoshop CS2"
  tell theDocument
    resize image width 600 height 776 resolution 150
    resample method bicubic
  end tell
end tell
```

Rotating Image Documents

To rotate the entire document, you may use the `rotate` command, which is also found in the *Photoshop Suite* of Photoshop's dictionary. For this command, simply specify the angle that you want the document to be rotated. For example, the following code would rotate the document 90 degrees clockwise. You may specify a negative value to rotate counterclockwise.

```
tell application "Adobe Photoshop CS2"
  tell theDocument
    rotate canvas angle 90
  end tell
end tell
```

Alternatively, the `rotate` command may be used to rotate a specified layer, rather than the entire document.

Applying Filters

Another image manipulation that can be performed in Photoshop using AppleScript is the process of applying a filter to a document. This is done using the `filter` command, specifying a layer on which to apply the filter, and indicating the filter you wish to apply. For example:

```
tell application "Adobe Photoshop CS2"
  tell theDocument
    filter layer 1 using blur
  end tell
end tell
```

There are dozens of filters available, which can be applied to images via AppleScript. A list of scriptable filters can be found in the *Filter Suite* of Photoshop's dictionary. One thing to be aware of when scripting filter application, is that many filters require that you specify options for the filter, in order to apply it. The `unsharp mask` filter is a good example. In order to apply this filter, you must specify values for the filter's radius, amount, and threshold options.

To specify options for a filter when applying it, use the `with options` parameter with the `filter` command. For example:

```
tell application "Adobe Photoshop CS2"
  tell theDocument
    filter layer 1 using unsharp mask with options
      [amount:50, radius:1, threshold:0]
    end tell
  end tell
```

When using filters, be aware that many filters will require that options be specified. To determine if a filter has required options, locate and view the class for the desired filter in Photoshop's dictionary.

Outputting Images

Now that we have discussed opening and manipulating images, let's talk briefly about outputting the images that our script may have just modified.

Saving Image Documents

In Photoshop, documents may be saved in a variety of formats, including EPS, GIF, JPEG, and TIFF, among others. To simply save a document in its current format, simply use the `save` command by itself, as follows.

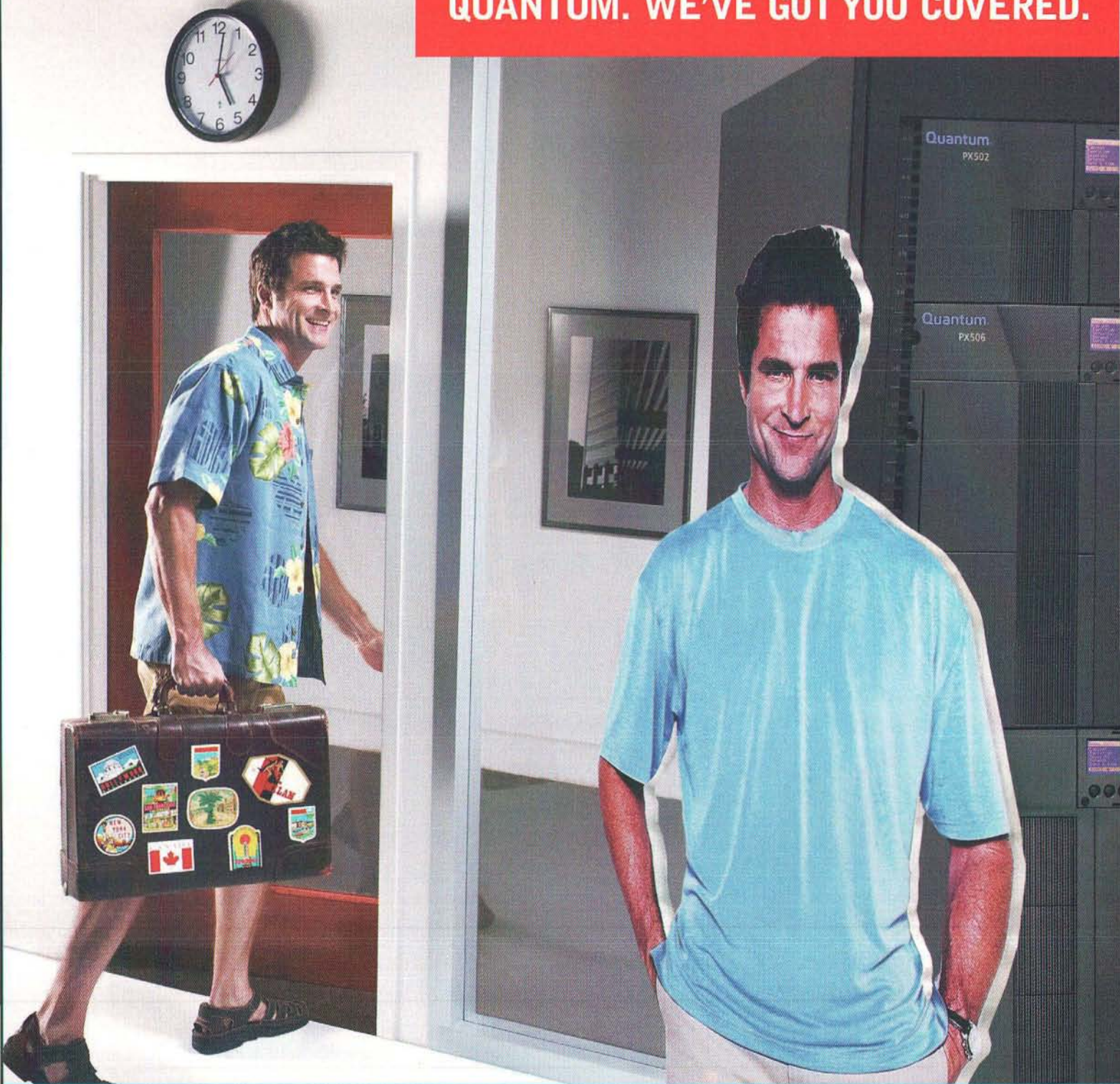
```
tell application "Adobe Photoshop CS2"
  tell theDocument
    save
  end tell
end tell
-> document "My Document.eps" of application "Adobe Photoshop CS2"
```

To save a document into a new location, utilize the `in` parameter of the `save` command, and provide an output file path. When doing this, you will also want to specify the type of file that is saved. This is done via the `as` parameter of the `save` command.

```
tell application "Adobe Photoshop CS2"
  tell theDocument
    save in "Macintosh HD:Users:bwaldie:Desktop:My Document.jpg" as JPEG
  end tell
end tell
-> document "My Document.jpg" of application "Adobe Photoshop CS2"
```

The above example will save the document in JPEG format, using the default JPEG save options. When saving any type of file out of Photoshop, it is also possible to specify the save options that are used. The save options for each output file type can be found in the *Save Formats Suite* of Photoshop's dictionary. See figure 4.

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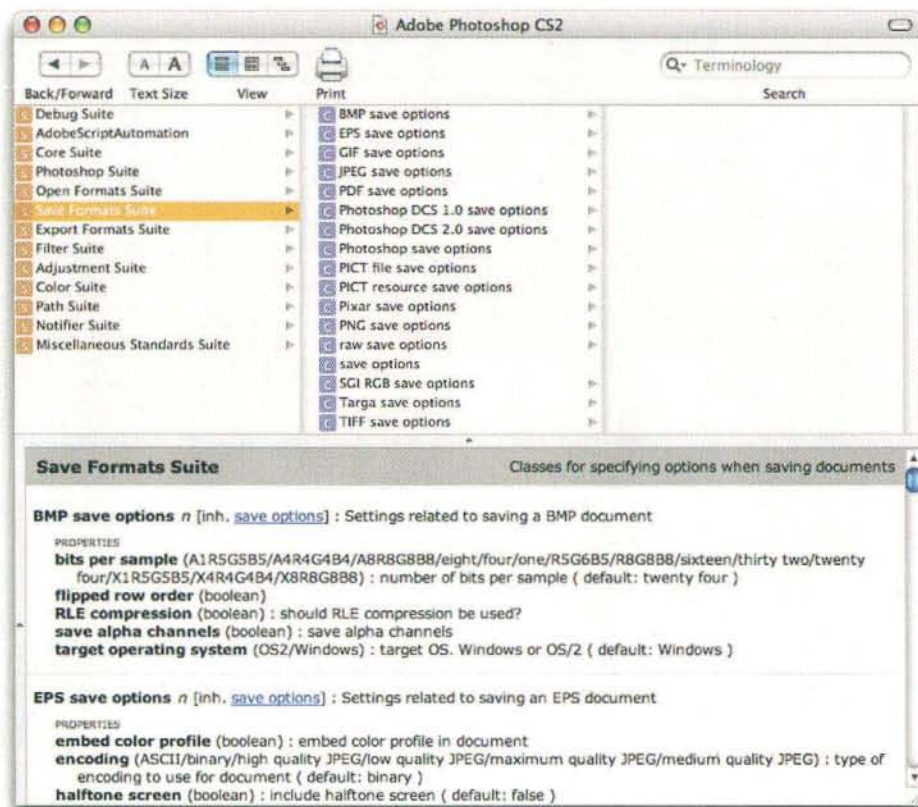


Figure 4. Photoshop's Save Formats

To specify save options when saving an image, use the `with options` parameter of the `save` command. For example, the following sample code demonstrates how to save a document as a JPEG, using certain specified settings.

```
tell application "Adobe Photoshop CS2"
    tell theDocument
        save in "Macintosh
HD:Users:bwaldie:Desktop:My Document.jpg"
as JPEG with options {class:JPEG save
options, quality:12, format
options:optimized}
    end tell
end tell
--> document "My Document.jpg" of
application "Adobe Photoshop CS2"
```

Exporting Images for the Web

Another method of saving a document is to make use of Photoshop's *Save For Web* technology. Rather than using the `save` command, however, this process is done via the `export` command. In doing so, you may specify the *Save for Web* options to be used during the export. The complete set of *Save For Web* options can be found in the *Export Formats Suite* of Photoshop's dictionary. See figure 5.

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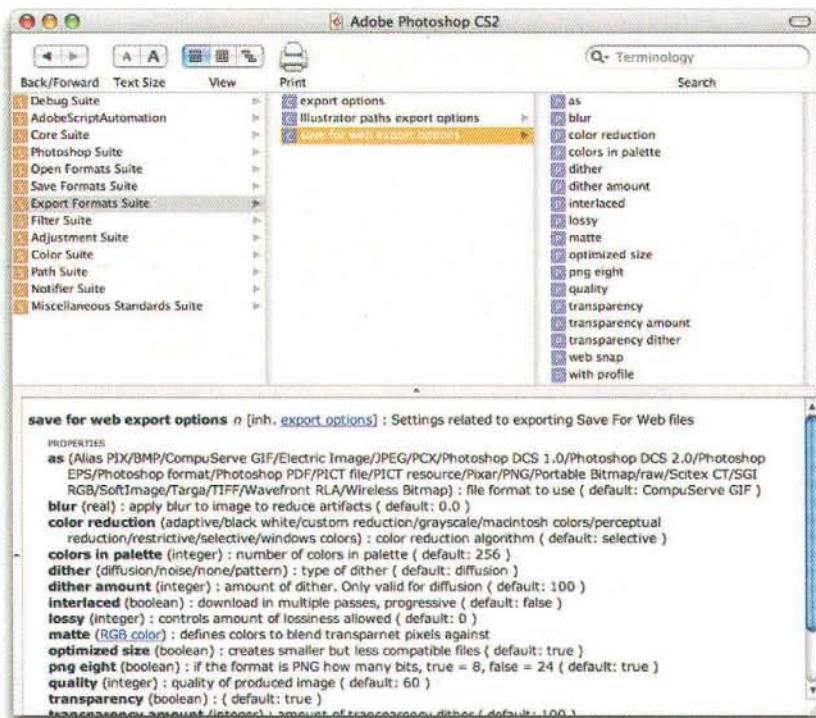


Figure 5. Photoshop's Save For Web Export Options

photoshop/sdk/index_scripting.html>. These documents will guide you through Photoshop's scripting support, and include example code and detailed information about Photoshop's AppleScript classes and commands.

In Closing

I hope that you now have a good idea of what is possible when it comes to scripting Photoshop. If you take some time to review Photoshop's dictionary in detail, you will find that there are plenty of other features that are accessible through scripting. If you use Photoshop in your daily routines, then you are more than likely encountering your fair share of time consuming and repetitive tasks. Sure, in some cases, you may be able to record a simple action to automate those processes. However, next time, I would encourage you to expand your horizons and try writing an AppleScript to do it instead.

Until next time, keep scripting!



The following example code will save an image in JPEG format via Photoshop's *Save For Web* technology, using specified export options. Due to a compilation issue with the `as` property of the `save for web options` class, in order to specify a file format when exporting in this format, a tricky workaround is necessary. Thanks to Nigel Garvey's insightful MacScripter.net AppleScript BBS <<http://bbs.applescript.net>> post for this great workaround!

```
tell application "Adobe Photoshop CS2"
    set theFormat to run script "tell application \"Photoshop\"
    to return [(class fltp>:JPEG)]"
    set theExportOptions to [(class:save for web export options,
    interlaced:true, quality:30) & theFormat
    tell theDocument
        export in "Macintosh
        HD:Users:bwaldie:Desktop:My_Document.jpg" as save for web
        with options theExportOptions
    end tell
end tell
```

Resources for Continued Learning

If you are serious about getting started with scripting Photoshop, there are some resources that can help you to proceed. First, perhaps one of the most valuable resources available is the Photoshop scripting forum at the Adobe user-to-user forums. This forum, along with several other forums for scripting (and using) Adobe applications, can be found at <<http://www.adobeforums.com/>>.

Some other great resources for Photoshop scripters are the *Photoshop CS2 AppleScript Reference Guide* and the *Photoshop CS2 Scripting Guide*, both of which can be found on the Adobe website at <<http://partners.adobe.com/public/developer/>

About The Author



Ben Waldie is the author of the best selling books "AppleScripting the Finder" and the "Mac OS X Technology Guide to Automator", available from <<http://www.spiderworks.com>>. Ben is also president of Automated Workflows, LLC, a company specializing in AppleScript and workflow automation consulting. For years, Ben has developed professional AppleScript-based solutions for businesses including Adobe, Apple, NASA, PC World, and TV Guide. For more information about Ben, please visit <<http://www.automatedworkflows.com>>, or email Ben at <ben@automatedworkflows.com>.

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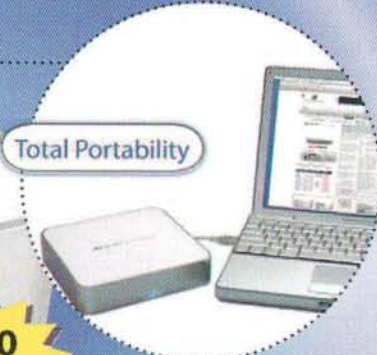
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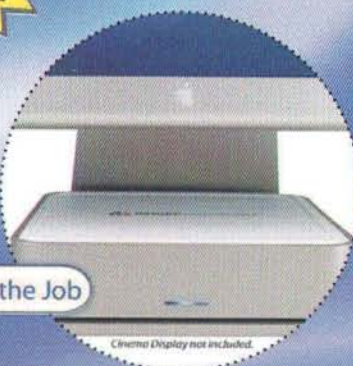


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To Tune, or Not to Tune

That is the Question

By Steve Modica

Welcome

One of the things I love about using a Mac is the way Apple supports their customers. Apple provides software and hardware to support the vast majority of their customers' needs. Their updates are reliable and simple, so that customers move to them quickly. As a result, I am typing this article on a system that is similar to 99% of all other Apple systems. If there is a bug lying in wait for me, chances are, someone else has discovered it, and the bug is fixed before I discover it. There is a lot to be said for strength in numbers.

Having spent many years supporting high performance computing customers, I have debugged many calls from customers who were quite sure they were not getting the best performance from their computers. In some cases, they were right! In most cases there were other factors that had nothing to do with system tuning. However, there is always this notion that some "wizard" can come along and wave his magic tuning wand, and for no additional investment, make your system go faster!

Sorting it Out

If you are a car mechanic, certainly, no one would tell you how to fix your car. There are experts who choose to change spark plug brands between summers and winters because they can detect a performance difference. Experts like these, also have the time, equipment, and experience to fix mistakes when they accidentally knock a hose off their engine while poking around. I'd like to refer to this as, "cars as a hobby." This is not about a need for a better-tuned car or a return on investment. It is about having fun working on your car and achieving perfection. These people are honing their art.

Like most PowerBooks, mine is a workhorse. It handles personal and business finances, email, web browsing, and various applications. There are gigabytes of data on there that are extremely important to my family, my business, and me. I don't believe my PowerBook is doing anything different from what Apple intended, nor do I need to tune it. There might be a 5% performance improvement somewhere if I tweak something here or there, but then my PowerBook is no longer like 99% of the other PowerBooks. But now, after making performance optimizations, my increased network performance or maximized disk performance puts me right at the front of the list for finding a hidden bug.

So when should you tune?

First, trying to tune a system that does not have the resources it requires to do the assigned job is like trying to tune

a cheaply made guitar. If you are serious about getting work done, get a well-made guitar. Second, if the system's usage pattern is typical, do not tune your system. You are better off taking advantage of all the similarly configured systems doing the same thing that are tuned the same way. But if **your** system is being asked to do something special, like serving only really large video files, then perhaps tuning is something you may want to consider.

If you call the system your "mail server" or your "file server," then there is a good chance your system is doing a specific task much more often than a typical system. This is when you may find some benefit in tailoring the system configuration settings to that specific task.

Physical bottlenecks

Let's start by considering a fileserver. Assuming your Xserve or "repurposed" PowerMac is not quite making the grade as your fileserver. The first question you have to answer is:

Is this System Capable of Delivering the Performance I Need?

The best way to find this out is to first understand what your traffic looks like, and then break the problem down into easily measurable elements. Files must be read from disk into memory; memory must be turned into mbufs and routed onto the network. Depending on what client systems are doing, clients may need to pull data into memory and then store it to their local disk drives.

Your fileserver must have several resources to operate efficiently. Perhaps the most important resource is memory. Users tend to read the same data over and over again. Operating systems have long since taken this into account with the use of a *buffer cache*. A buffer cache is an area, set aside in memory, to store information temporarily. This is done so that the CPU can perform other tasks while the IO device fills up the buffer cache. The most recently read data is saved in memory so that it can be accessed quickly, without issuing a redundant read operation to the disk. Similarly, it is often the case that when we read the first byte of a file that we will continue to read many more bytes. Operating systems take this into account and

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perform *read-ahead* operations. This enables the operating system to have the data you need in memory even before you have requested it.

Assuming your system is equipped with ample resources; it is easy to isolate the physical limitations of the individual devices. For example, if you have 10 client systems retrieving data from a file server, and each client is achieving 90Mb/sec, then your aggregate network bandwidth is 900Mb/sec. This is the maximum bandwidth of a single Gigabit port. That is a very reasonable limitation. It follows then, that if you want better IO performance for your clients, you simply need to add additional Gigabit ports, and allocate these resources appropriately for each client. You may also see that your CPUs are at 100% utilization, or that your disk bandwidth is at its theoretical maximum throughput.

If you find that the system performs well at certain loads (1-3 clients), but begins to degrade drastically below its physical maximums as you add clients, then consider adding memory so that the operating system has more buffer cache to work with. It is very likely that you simply do not have enough memory, so that each client access requires a direct disk IO operation. If there is not enough memory for buffer cache or not enough memory for the operating system perform read-ahead operations, then disk IO operations become very inefficient.

One way to check how much memory is available for things like the Buffer Cache is to look at the Activity Monitor (Applications -> Utilities -> Activity Monitor). This utility allows the user to examine a number of system resources including CPU, memory and disk bandwidth. Looking at the System Memory pane, one can see how much memory the system is using. "Inactive" memory is memory that has been written out to disk, but is being kept around in case users attempt to access it again. Consider how much data each of your users is accessing and reusing continuously during an edit session. If a typical user is operating on 8GByte files and you have a few hundred MBytes of cached disk data, you probably do not have enough cache. Each time your users move around within their project, they are forcing the system to go back to disk, which creates a large number of inefficient IOs. Simply adding a few Gigabytes of memory will help performance immensely.

Why is it Sometimes Necessary To Tune Your Network?

Wouldn't it be great if somebody wrote a utility that analyzes your network and automatically selects the optimum settings? They already have! It's called TCP/IP, but occasionally it requires some attention. In most cases, TCP works remarkably well all by itself. Tuning is needed in cases where TCP is not optimized because the network behavior is not normal.

TCP/IP is not controlled by any manufacturer and is designed to work on almost any kind of underlying network with widely varying characteristics. To meet this challenge, the protocol designers made TCP adaptive. TCP is self monitoring and optimizes its own behavior to match the network environment. Adaptation takes time and the default settings cannot be optimized for every possible kind of network.

There are also many independent implementations, and the protocols continue to evolve in response to practical experience, and some implementations have peculiar compatibility constraints.

Typical network abnormalities are:

- Asymmetric connections. These are connections that are much faster downstream, than upstream.
- High performance connections with relatively long latency (measured in bytes) such as fiber optic, satellite, or point-to-point protocol (PPP) over a cellular network.
- Point-to-point Protocol over Ethernet (PPPoE) implementations that restrict the maximum transmission unit (MTU) on the network without support for Path MTU Discovery or fragmentation.
- Heavily congested links. Tuning cannot solve everything. You may need to restructure your network or use packet shaping to control traffic flows.

The key to optimization in such cases is to measure, adjust, and repeat. Notice that it's not necessary to find the perfect settings, only to get close enough that TCP works efficiently in your environment. The tools included with IPNetTunerX from Sustainable Softworks are designed to make this easy and show how well TCP is actually working. (Refer to <http://sustworks.com> for more information.) Keep it simple. IPNetTunerX offers a collection of presets to solve the most common tuning problems for users with asymmetric broadband connections.

The follow screen shot shows the Basic panel from IPNetTunerX. The Basic panel enables you to select presets that tune certain activities like connecting a Bluetooth phone or just browsing the internet.

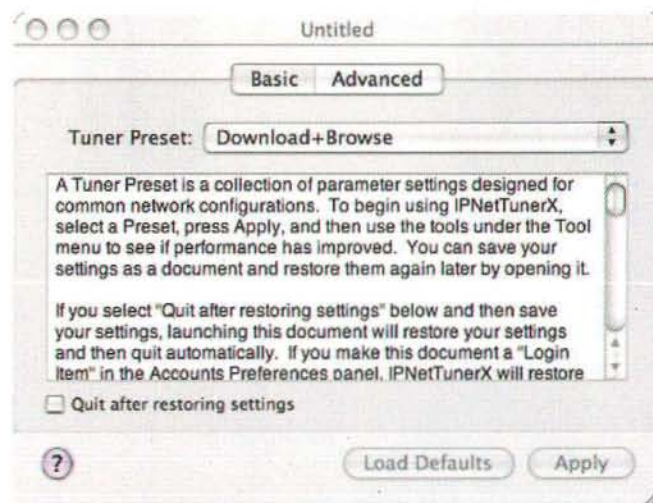
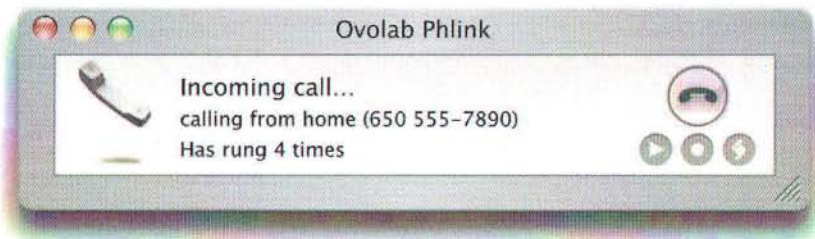


Figure 1. IPNetTunerX Basic Panel

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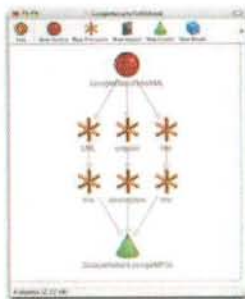
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The following screen shot shows the Advanced panel. The Advanced panel enables you to tune individual parameters like the TCP send and receive space.

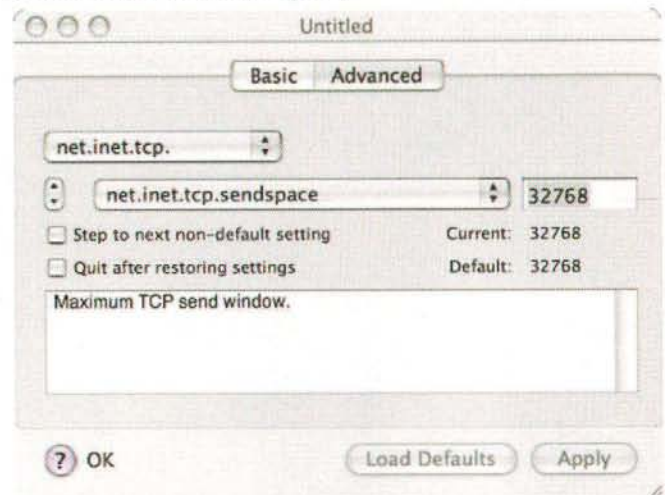


Figure 2. IPNetTunerX Advanced Panel

What if I have more than one kind of network connection, like wireless internet served through a satellite? Which one should I tune for?

Just as a chain is only as strong as its weakest link, you want to tune your connection to improve performance over the weakest link or bottleneck. If the connection is highly asymmetrical, has an MTU restriction, high latency, or some other problem, you make adjustments to compensate. The term *tuning* is misleading in this case because it suggests that you make adjustments to find the optimal setting. A "bottleneck bypass" is a better description. Getting around a bottleneck might reduce performance slightly in another area, but this usually isn't a problem.

Can I tune TCP differently for my Ethernet LAN versus Internet connection if they use different network ports?

TCP sits above the IP network layer so doesn't normally know how the underlying data is routed.

Can I tune TCP at my router, or do I need to tune TCP at each host on my LAN?

TCP is end-to-end, so it generally makes sense to tune TCP at one or both ends of the connection. Some devices offer a packet shaping feature that enables you to adjust TCP traffic flows to reduce congestion. Another possibility is to use a proxy server so that external connections originate from a different host. Depending on the problem, these might be appropriate but are generally more involved.

MA

About The Author

Steve Modica is CEO of Small Tree Communications, leading designer and manufacturer of high-performance network products for Mac OS X.

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Windows SharePoint Services (version 3) on the Mac

By Brian Johnson

Welcome

In my last article, I discussed how Mac users could make the most of Windows SharePoint Services (version 2). In this article, I'll tell you about the next version of Windows SharePoint Services (version 3) now available in beta, and how you can use this new version effectively from the Mac.

What's New?

There are a lot of new features in Windows SharePoint Services v3. The first thing that most Mac users will notice is an updated user interface that renders much better on the Mac in both Firefox and Safari. The new templates render well and you'll notice better performance when you are customizing your sites and pages from the Mac. Figure 1 shows a Windows SharePoint v3 site in Edit Mode in Firefox.

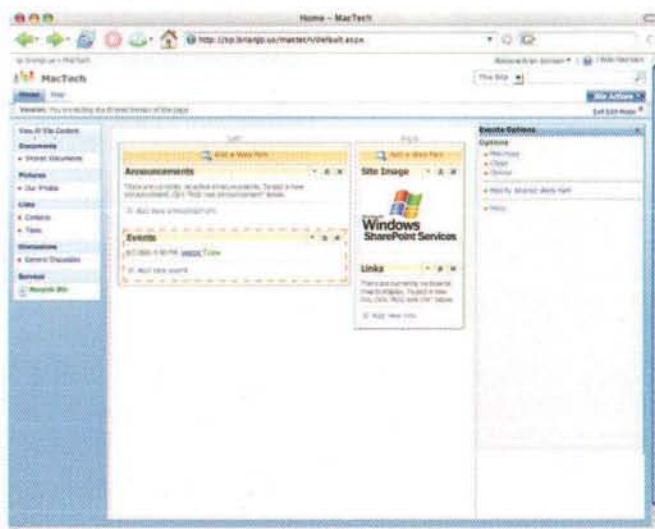


Figure 1. SharePoint v3 site rendered in Firefox on the Mac

Windows SharePoint Services v3 ships with 6 standard site templates. These templates include some of the site types your familiar with from v2, plus a couple of new ones:

- **Document Workspace**
- **Team Site**
- **Blog**
- **Wiki**
- **Meeting Workspace**
- **Blank Site**

The two most commonly used templates are probably the Document Workspace and the Team Site.

A Document Workspace essentially acts as a very smart folder, which supports collaboration on one or more shared documents and supporting files. The Document Library folder supports check in/checkout and versioning and the site features a Task list and a Links list that a group can use to track assignments and progress on the document.

A Team Site is very similar to a Document Workspace, but the scope is usually wider, serving the needs of a larger group of individuals. Team Sites feature a Document Library, an Announcements List, a Calendar, Contacts and a Quick Links list by default.

The Blog site is a new feature in Windows SharePoint Services v3. A blog is simply a list of stories posted with the latest item at the top of the list. This makes it easier for readers to scan a list they've seen for the latest news from the blog. The Blog site in SharePoint v3 also features an RSS feed and the ability for others to comment on blog posts. This ability to comment on posted items allows for the exchange of ideas between the author of the blog and the readers and even between the readers themselves. You can see an example of how the SharePoint v3 Blog site looks in Figure 2.



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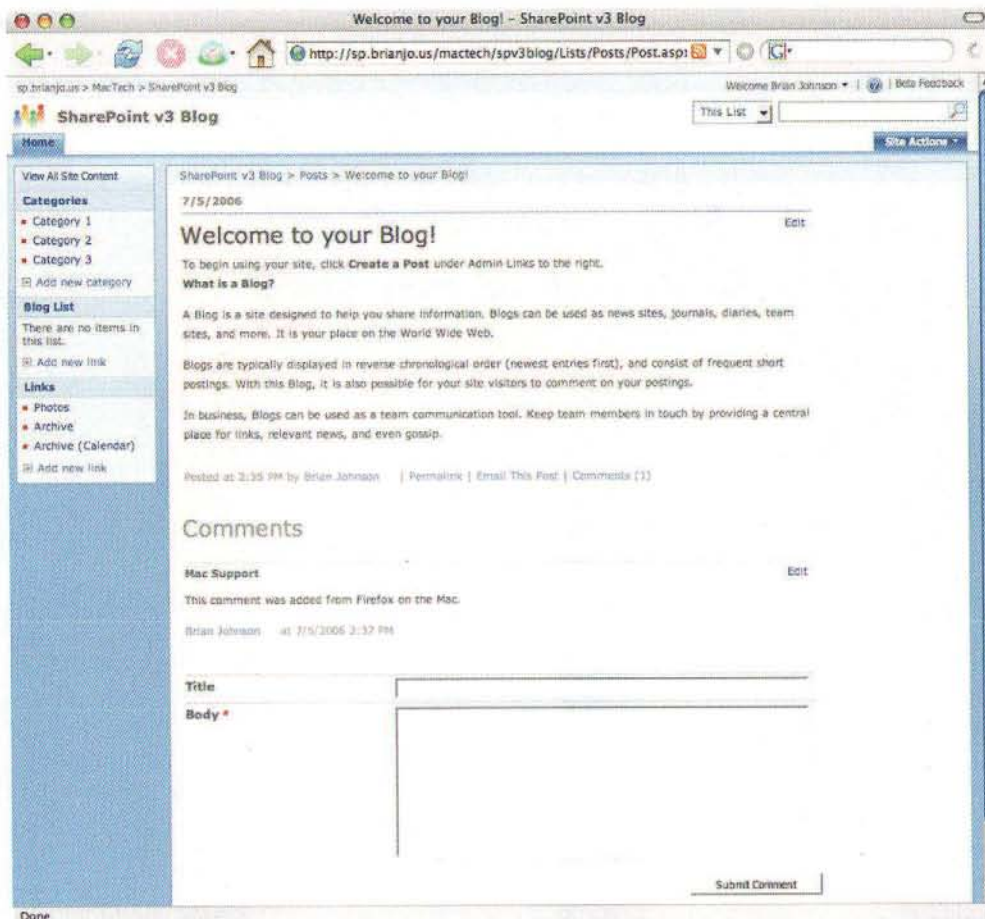


Figure 2. A Blog site in SharePoint v3.

Another new site template in SharePoint v3 is the Wiki site. A wiki is a site that allows any authorized user to edit a page quickly and easily. One of the features of the wiki that make it a powerful tool for collaboration is the ability to instantly create a new page based on a term in the current page. Adding double brackets around a word in a paragraph creates a hotlink to a new page in the wiki. Wikis work well as sites where group knowledge is stored and retrieved. For example, you can use a wiki to store information about configuring machines on the network. As the information around that topic changes, admins and users can update the data on the pages of the wiki so that the information is always up-to-date. Wikis can also be used for brainstorming, research, and for planning. Individuals and groups can use a wiki to store meeting notes and other textual information that needs to be updated on a regular basis. SharePoint v3 wiki pages work well on both the PC and the Mac, but only the PC version running in Internet Explorer features a WYSIWYG editor. Users writing to a SharePoint wiki on the Mac

will need to use simple HTML markup for formatting and linking.

A Meeting Workspace is a site used to track meeting notes and schedules. At launch SharePoint v3 is scheduled to provide 5 different workspace types.

Finally, the Blank Space is just that, it's blank. This means that you can start a site with just the content you want.

New Content

The version 3 SharePoint sites features an updated Create Page where you can add many of the features I've mentioned already to an existing site. This means you can add additional Document Libraries, Wiki pages, tracking calendars, and even sub-sites to an existing SharePoint site.

The content page types that can be added to a SharePoint v3 site are broken into 5 categories; Libraries, Communications, Tracking, Customer Lists, and Web Pages.

Library types include the Document Library, the Form Library, the Wiki Page Library and the Picture Library. The only library type that might prove difficult for Mac users to use is the Form Library. Form Libraries depend on features found in Microsoft InfoPath, which isn't available on the Mac. The other library types should work fine, except in cases where functionality is dependent on an ActiveX control, for example, when you want to export a list to a spreadsheet.

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Communications page types include Announcements, Contacts, and Discussion Boards. Of these, the Discussion Boards feature is interesting in that the boards created in SharePoint v3 have the look and feel of modern web discussion boards and the interface is easy to use from the Mac.

The Tracking page types include Links, Calendars, Tasks, Issue Tracking and Survey pages. One of the most exciting new features of SharePoint version 3 is the Project Tasks tracking page type. This new page type provides a Gantt Chart view that allows you to instantly see the status of items in a project list. This is a great feature for users managing small projects and it works well on the Mac. Figure 3 shows the new Project Tasks page with a few items added.

In the Custom List category, the Custom List view is the only one that works well on the Mac. The Custom List in Datasheet View selection will work, but you don't get a datasheet, you get a simple custom list. The

Import Spreadsheet function doesn't work on the Mac as this feature uses ActiveX controls.

Finally, the Web Pages category includes Basic Page, Web Part Page, and Sites and Workspaces. The Web Part Page and the Sites and Workspaces pages are fairly straightforward and should work well on the Mac. In the beta version of SharePoint v3 that I used for the article, it wasn't possible to edit the Basic Page directly in SharePoint, though you could download an edit a

custom page if you need to from the document library where the page is stored. For quick, custom pages, I suggest using the Wiki Page Library feature and creating your custom pages there.

A Typical Workflow

I covered the workflow for SharePoint version 2 in my last article. That workflow is very similar in SharePoint v3, but the user interface is different so it's probably worth walking through a

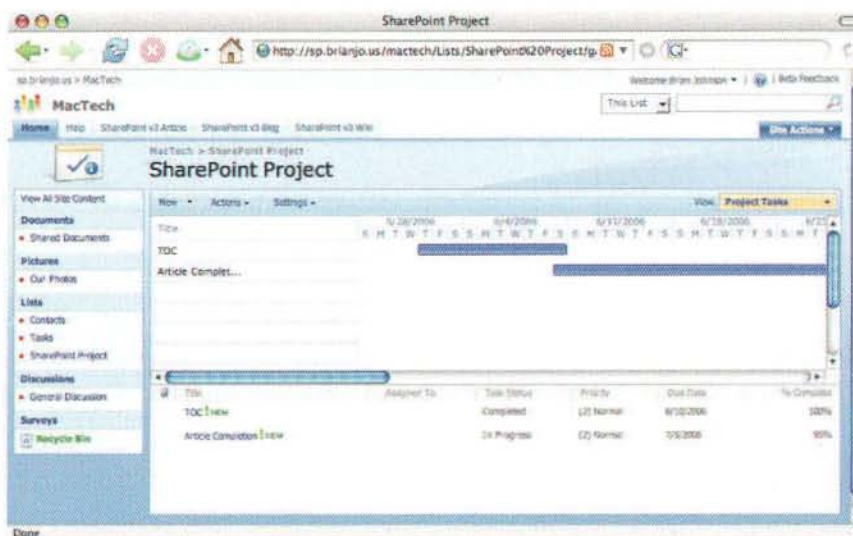


Figure 3. A Gantt Chart in a Project Tasks list.

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typical document sharing workflow from the Mac. The document workflow for SharePoint v3 is fairly straightforward and consists of the following steps. In our example, we'll add a new Microsoft Word file to a document library from the Mac.

1. Create your new document in Microsoft Word 2004 for Mac and save it somewhere on your local machine.
2. In your SharePoint v3 document library, click upload and use the Upload Document page to add the file you created in Word to the SharePoint document library.
3. The document is now available in the SharePoint document library.

To modify this file, a Mac user should follow these steps to ensure that the file is locked while they work on it and is then updated properly on the SharePoint site.

1. Check out the file by mousing over the file name in SharePoint and click Check Out in the dropdown menu.
2. Click on the file name to download the file to the Mac.
3. Work on the file in Word and save your work.
4. Click Upload in the SharePoint document library to open the Upload Document page.
5. Use the browse button to add the document to the Name text box and make sure that the *Add as a new version to exiting files checkbox* is checked.

6. Click OK.
7. At this point your document is uploaded, and you should see the page shown in Figure 4. This page prompts you to check in the document that you've uploaded so that others can work on it.

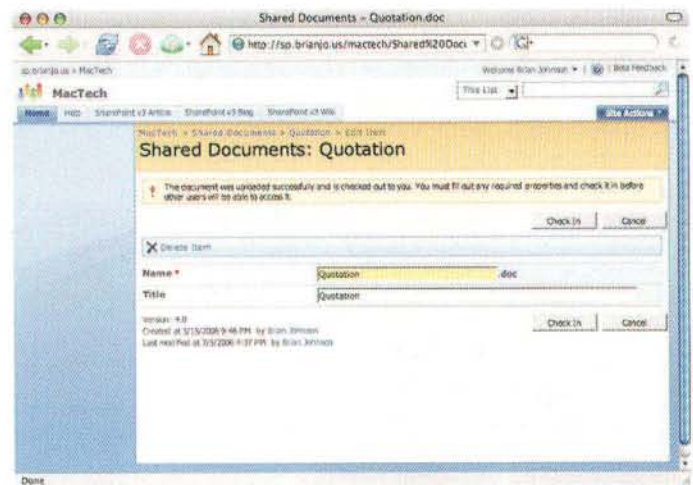


Figure 4. After updating a document that you've checked out, you'll be prompted to check it in.

Working Different

The new user interface that you'll see in SharePoint version 3 should make it easier to figure out how to check files in and out from the Mac. At the very least performance is much better in v3 on the Mac and the pages render quite well. In this article I only touched on some of the new features of SharePoint version 3 that Mac users will want to check out. For a full list of new features, take a look at some of the resources listed at the end of this article. Windows SharePoint Services (version 3) should be available in sometime in late 2006 or early 2007.

Resources:

Microsoft Office 2007 (for Windows) Preview Page (contains links to the Windows SharePoint Services version 3 beta)
<http://www.microsoft.com/office/preview/beta/testdrive.aspx?showIntro=n>
 Microsoft Windows SharePoint Services (version 3) Technology Guide
<http://www.microsoft.com/office/preview/technologies/sharepoint/technology/guide.aspx>

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About The Author

Brian Johnson is a Product Manager with Microsoft's Macintosh Business Unit. You can read his blog at <http://bufferoverrun.net> and you can drop him a line at brianjo@microsoft.com

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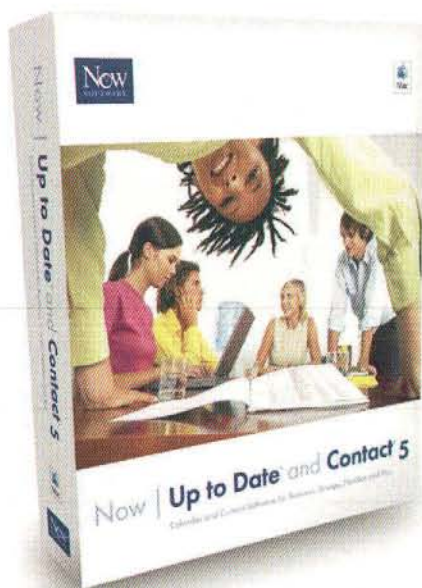
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The MacTech 25

By Dean Shavit

On The Meaning of Influence

WWDC is a gathering of many ambitious developers, savvy system administrators, Macintosh consultants, technical writers and journalists together with Apple's own development and IT engineers, where ideas are exchanged in a highly-charged atmosphere. It's where the "curtain" that separates the technologists of Cupertino from the "rest of us" who make their livings working with Mac OS X and Mac OS X Server is drawn aside for one busy week. Among the thousands of attendees are a couple dozen people whose work helps shape the technical agenda for everyone else in the industry as well as arc of the discussion. Many such threads of thought, inspiration and conversation begin at WWDC and end up embedded in the software people use to do their daily work or in a network design or deployment.

Influence is measurable by many facets, and this group of twenty-five accomplished individuals, accompanied by the seven honorable mentions that were kept off of the main list by "the rules," represents a wide range of technical talent, communication skill, teaching ability and community-building expertise. The MacTech 25's gifts are also frequently accompanied by a heaping helping of wit, a killer sense of humor, and an often an extreme willingness to help others.

It's not easy to categorize these folks, but there are some loose categories that can help us understand why and how the MacTech 25 are helping shape our professions. The Old Guard are folks who were influential Mac folk before the advent of Mac OS X. The New Guard are folks were where influential after the advent of Mac OS X. The Hackers look for ways to wring the most out of Mac OS X either by spreading knowledge of how to do so or by writing scripts or tools. The Modders are busy creating tools that modify Mac OS X in significant ways to enhance it or overcome perceived shortcomings. The Press is the press. The Authors write books about the Macintosh. The Teachers share their knowledge, whatever that may be. The Coders are the developers that make using Mac OS X worthwhile, because without software, we'd be nowhere.

Aaron Hillegas

Hof Cocoa and a Cool Cowboy Hat

Want be a Mac OS X Cocoa Developer? Well, you have to start somewhere, and it seems that 99% of those who have successfully made it recently in the Cocoa coding business cut their teeth on Aaron Hillegas's book *Cocoa Programming for Mac OS X*. Despite its draught-horse title, people code like the pony express after reading it, and by sheer number of recommendations and homages paid, there's little doubt it

provides a lucid and friendly entry-point to what can be a somewhat daunting set of tools. Aaron worked for NeXT and then Apple before founding Big Nerd Ranch, which provides world-class training for Mac OS X and Unix developers. Aaron also co-authored *Advanced Mac OS X Programming* with Mark Dalrymple as well as parts of the Mac OS X client for AOL, along with a few "other" projects along the way for companies like Nortel Networks, and the United Parcel Service.

Member of: the new guard, the authors, the teachers

Adam and Tonya Engst

TidBITS and Books on the E-Prarie

In the publishing industry, it's somewhat difficult to assign the label of "pioneer." Of course, there's Johann Gutenberg, the inventor of moveable type and namesake of the Gutenberg project, a repository of 17,000 e-books in the public domain (<http://www.gutenberg.org>). If there's a Gutenberg(s) in the



Macintosh Technical community, it's Adam and Tonya Engst, the dynamic duo that produces TidBITS (<http://www.tidbits.com>), a weekly e-zine that's been continuously published in various forms (hypercard stack, etext, html) since 1990. As editors and publishers of the highly successful "Take Control" ebook series, Adam and Tonya have not only made the transition from the old-guard to the new-guard, but managed to maintain (and even advance) their standing and contribution to the Macintosh technical and end-user community. Adam and Tonya are currently active in groups like MacNotables (<http://www.macnotables.com>), and as contributing editors to magazines such as MacWorld.

Member(s) of: the old guard, the new guard, the authors, the press, the teachers

Amit Singh

Mac OS X Hacker Numero Uno

Someone has to wear the crown of top Mac OS X Hacker, and no one who has visited Amit Singh's website—<http://www.kernelthread.com> (now superseded by www.osxbook.com) would argue otherwise. It covers an amazing range of Mac OS X topics including command-line tools, an open contest to explain a flaw in the Mac OS X kernel, how to turn the sudden-motion sensor

in a Powerbook into a game controller, as well as side-splitting anecdotes such as his misadventures at the local Apple store when picking up his Powerbook and being bullsh_ted by a Genius. Amit recently acquired a MacBook Pro and promptly whipped up a daemon for controlling infrared input to



complement his other tools like HFSDDebug and SMSRotateD, (which rotates a Powerbook or Macbook's display if you stand it on its side). He's currently tinkering with the ambient light sensor, so I'd expect a keyboard light show that strobes with the iTunes visualizer any day now. Amit's book *Mac OS X Internals*, a 1650-page exploration of Mac OS X was just published by Addison Wesley, after he worked on it in his *as a bobby* while employed at the IBM Almaden Research Center prior to accepting a position with Google in May. As Josh Wisenbaker (also of the MacTech 25) so aptly put it, "Everything Amit writes is required reading."

Member of: the new guard, the authors, the hackers, the modders, the coders, the teachers

Andrina Kelly

A Little Script of This . . .

If you've got one Xserve and a terabyte of data to manage, then your day-to-day responsibilities might be pretty routine, but when you're managing an Xserve G5 Shake render farm for a crew of animators working on a Hollywood feature animation to be released by Walt Disney



studios, you're truly into high-powered and big-budget computing. Andrina Kelley has been working with Macs since 1985, but it's her UNIX system administration and scripting language skills (Python, tcl) that have quickly become legend, as she's shared her experiences with high-performance computing as a contributing editor to online Mac OS X Server Community and e-zine afp548.com and in presentations at MacWorld and WWDC sessions. Also a storage expert, Andrina manages over fifty terabytes of data while working at C.O.R.E Feature Animations (taking care of over 200 Macs) which just released its first full-length animated feature, *The Wild*, in which Andrina's name appears in the credits for "administrator: Apple Systems."

Member of: the new guard, the hackers, the teachers

Andy Ihnatko

The Merry Prankster

Known for his unflappable persona, razor-sharp sense of humor and world-class prose, Andy Ihnatko goes about the

business of reporting developments in Macintosh Technology with a sense of play that few "serious" journalists would allow themselves. Yet Andy is a very serious journalist indeed. As technology columnist for the Chicago Sun-Times, he reaches one of the largest readerships in the country, delivered the keynote address at MacWorld Boston, is author of *The Mac OS X Tiger Book* and *The Mac Xcode 2 Book* (which is a great primer for high-school students learning to code) among others, and develops AppleScript Studio applications as well as Automator actions such as his "The Tactical Heads-Up Display Workflow!" presented at MacWorld which printed a map upside down and backward to reflect on the inside of car windshields. Some of his finest efforts can be found on his blog "Yellowtext" part of his "Colossal Waste of Bandwidth" web site. Among them is a wonderful anecdote about getting a query from an Apple publicist asking if he'd be willing to interview Steve Jobs, and what it felt like to wait for the call that never came.

Member of: the new guard, the old guard, the authors, the press, the coders, the teachers

Ben Wilson

Mr. Fixit

MacFixIt.com was one of the first Macintosh technical mega-sites. Started in the mid-1990s, MacFixit is now part of TechTracker Inc., and remains one of the pillars of the Mac web, with an amazing trove of archived information available for an annual subscription of \$24.95/year. For many who need



to support Macs in schools and corporate America, Mac Fixit is a must-have. Since 2002, Ben Wilson has been the Editor of MacFixit.com, leading the site during the Mac OS X age and continuing the long tradition of excellence established by MacFixIt founder Ted Landau. Currently, Ben produces the "AQuickFix" podcast series www.macfixit.com/quickfix.rss, and ensures that MacFixIt remains on the cutting edge of troubleshooting and break fix news for its half a million readers.

Member of: the new guard, the press

Brent Simmons

The News Dude

For as long as the Internet's been around, people have debated how and when it would fulfill its potential as a news delivery medium. As more and more Internet news junkies adopt RSS (real simple syndication) feeds as the mechanism for delivery, they need



software that collects that news into a single window for easy digestion. Brent Simmons of Ranchero software is the author of NetNewsWire, one of the best RSS aggregators, which won him an Eddy award at MacWorld, an O'Reilly Mac OS X Innovators award, and a spot in last October's "Night at Adler," organized by Drunkenbatman of <http://drunkenblog.com> which featured several of the MacTech 25. Not only does Brent and Ranchero software facilitate reading Internet news, his other well-known product is MarsEdit, which helps bloggers *create* the news in the first place. And where did Brent get his start in Cocoa programming? By reading Aaron Hillegas' *Cocoa Programming for Mac OS X*, what else?

Member of: the new guard, the coders

Dan Frakes MacWorld Pivot Man

In the Macintosh technology world, there's a small but talented group of journalists whose voices are well-known, respected, and authoritative members of the mainstream press. It also seems that many of these voices are either cultivated by or flock to the most mainstream of all Mac periodicals: MacWorld. One just doesn't get to write for MacWorld these days; you have to be "somebody" first. Dan's currently MacWorld's Senior Editor, writes the MacWorld "Gems" column and is the Senior Reviews Editor at *Playlist*, as well as a contributing editor and columnist (and former editor) of MacFixIt. He will be speaking in MacMania 5, a cruise (<http://geekcruises.com>) that also features speakers such as Steve Wozniak. Over the years, Dan has written or contributed to a number of popular Mac books, and created one of the first "eBooks" a decade ago. When not writing about Macs, gadgets, iPods or audio, he spends his time with family or shooting hoops.



Member of: the new guard, the old guard, the press, the authors

Danny Goodman Kung-Fu Master

Not many people have been writing about technology and computers *full-time since 1981*, and if there are some out there, none are as visible and respected as Danny Goodman, and certainly none who are masters of the Macintosh. His *Complete Hypercard 2.2 Handbook*, now in its fourth edition has sold over 300,000 copies in various languages. His *AppleScript Handbook*, (most recent edition from SpiderWorks eBooks), is considered to be the very best introduction to AppleScript after over ten years in print. Other subjects Danny's mastered have been JavaScript and DHTML. Recently he wrote the *Mac OS X Technology Guide to Dashboard*, also from SpiderWorks. His

book *Spam Wars* is also considered to be one of the best explanations of what Spam is, why it exists, how to combat it, and why Spammers do what they do. Over the years, Danny has penned hundreds of magazine and electronic articles for Netscape, Apple's Developer Website, and the O'Reilly Network. How does such a long-term Master known for accessibility and interest to novices and experts alike get their start during a time when computers were *just* getting their start? By earning a B.A. and M.A. from the University of Wisconsin-Madison in Classical Antiquity, of course.

Member of: the new guard, the old guard, the press, the authors, the teachers

David Pogue Honey, I Found the Manual!

When you've invented a way to market something that's so right and appropriate sometimes that brand name often becomes synonymous with your name. For David Pogue, that brand is "The Missing Manual." So appropriate in terms of both the need it fills and the promise of what it delivers, the phrase "Missing Manual" also captured a fundamental shift in expectations regarding both the bundled software that ships with your Mac, but also whose responsibility it is to teach you how to use that software. David Pogue sensed that shift, and timed his "Missing Manual" series perfectly, capitalizing on its success by creating his own brand-within-a-brand (the Pogue Press in Partnership with O'Reilly). Old-guard fans will remember David for his *Mac Secrets* collaboration with Joseph Schorr, widely considered to be one of the finest pre-Mac OS X books for Mac power users. David's battle with tenosynovitis (akin to carpal-tunnel syndrome) hasn't slowed him down one bit, and his search for hardware and software solutions to a medical problem has been fascinating. In addition to being the mastermind of the Pogue Press, David is also a technology columnist for the New York Times.

Member of: the new guard, the old guard, the press, the authors

John Gruber Shooting Star

To say that someone who made the MacTech 25 is a "blogger" puts them squarely into the new guard of the MacTech 25. To say that John Gruber is a blogger is to miss the point entirely. John is as good a writer as anyone who writes books or for the print media, it's just that his chosen medium is electronic and web-based, completely focused on the technology that makes it possible. Occasionally, he'll also strike a chord that resonates across the whole Macintosh community, as he did when he proclaimed: "The Location Field [of web browsers] Is the New Command Line," or my personal favorite: *iLife '06 From the Perspective of an Antbropomorphized Brushed Metal Interface*. "Safari: Hey. Brushed. What's up? Brushed Metal: Ah, you know. In the neighborhood, figured I'd stop by. Tried calling you, but

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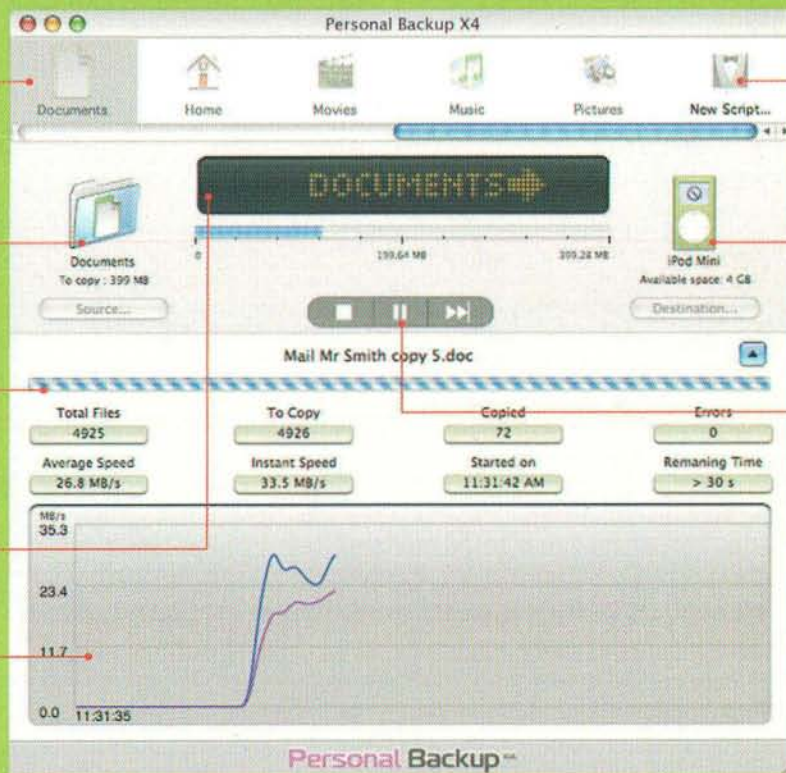
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kept getting your voicemail. Safari: (bemused) It's like eight in the morning. Brushed Metal: Really? Wow, I thought it was like ten. (Holds left wrist out.) Lost my watch . . . "

Member of: the new guard, the press, the coders

John Siracusa

The Long, Long, Long, Article

John Siracusa did us all a *huge* favor in April of 2005 when he published his highly detailed, insightful, amazingly well-researched and seminal article on Mac OS X 10.4 on <http://www.arstechnica.com>. Those of us who are developers might have dipped our toes into the documentation, but John Siracusa bathed in it, apparently for many months. The result was a summary of changes in Mac OS X that was *just the right thing* for all of the tens of thousands who read it. His treatment of extended attributes for ACLs, the mds (metadata service) that powered Spotlight, and launchd, just to name a few, brought these new technologies into focus for nearly everyone who cared to read about it, telling us how they worked without having to wade through the morass of Apple's developer documentation. You can catch up with John as he lobbies hard for things like garbage (memory) collection for Objective-C applications on his blog "FatBits" <http://arstechnica.com/staff/fatbits.ars> as well as the replacement of the Mach (XNU) Mac OS X Microkernel with something (anything) better.

Member of: the new guard, the press

Jonathan "Wolf" Rentzsch

Mac OS X Modder Numero Uno

If you created an open-source project that allowed other programmers to do spectacular things with Mac OS X that even Apple's own developers didn't think possible, would you deserve to be crowned "king of the modders?" If you're the Jonathan "Wolf" Rentzsch, and you came up with *mach_star* (http://rentzsch.com/mach_star/), which allow programmers to both override (*mach_override*) the kernel as well as inject code into another running process (*mach_inject*), then the answer is "Meh." OK, well, the answer is really a resounding "absolutely," but the more you get to know Wolf by his writings for Apple's Developer site or IBM's Developerworks (<http://www.ibm.com/developerworks>), his own RedShed software site (<http://redshed.net>) or his appearance at Drunkenbatman's "Evening at Adler," the more you find yourself saying "Meh" to things just like he does. *Mac_star* makes the magic of Desktop Manager and Virtue Desktop possible, as well as recent iterations of software such as Allume's Stuffit and The Missing Sync. It's currently unknown how many developers use *mach_star*, but since



Wolf made it open-source, anyone can wield this powerful tool. Currently, Wolf works as a developer gun-for-hire, but also leads the Chicago CAWUG (Cocoa and WebObjects User Group). Of his notable contributions to the community in 2006: an article in TidBITS that led to the method of creating an external drive than can boot both Intel and PowerPC Macs.

Member of: the new guard, the press, the coders, the modders, the hackers

Josh Wisenbaker

Macshome Improvement

2005 and 2006 have been spectacular years for Josh Wisenbaker. He went from an underappreciated systems engineer at an Apple Specialist in North Carolina to a Senior Engineer at a Fortune 40 company – Lowe's home improvement stores. Previously, Josh was known "macshome" the sidekick of Joel Rennich and co-editor of AFP548.com, the online Mac OS X Server community and e-zine. Just as John Siracusa might have had the most-widely read article on Mac OS X, there's no doubt that Josh's article on Mac OS X Server 10.4, published on afp548.com the day it was released, filled the exact same role for the technically curious server admin, followed by articles covering launchd and ACLs in depth. Some say that "timing is everything," and it seems that Josh's timing couldn't be better. Just when Joel Rennich became consumed doing integration work in his new position as a Consulting Engineer for Apple, and couldn't produce as many articles for afp548.com, Josh stepped up to the plate and has hit home run after home run. He's gone from "helping" at WWDC and MacWorld Sessions to a being a speaker in his own right, and is now one of the most visible Mac OS X Server gurus on the Internet. In 2005, Josh was offered, and accepted, an invitation to join the Steering Committee of the Mac Enterprise Project, <http://www.macenterprise.org>.



Member of: the new guard, the press, the hackers, the teachers

Michael Bartosh

1977-2006

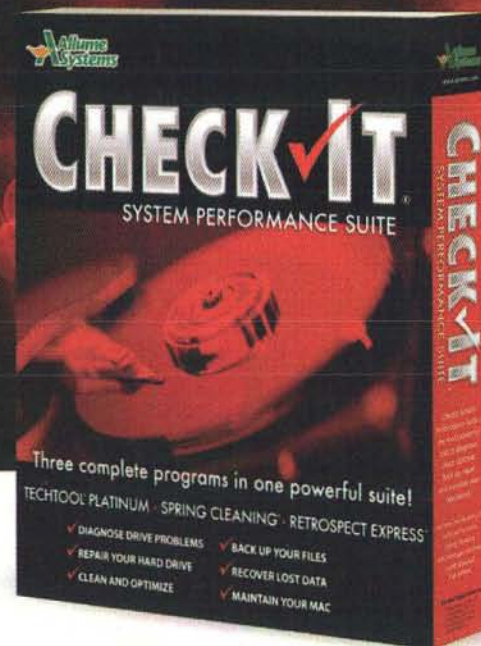
I looked up to and learned from Michael Bartosh, as did many of my colleagues. Unfortunately, he passed away during the voting for the MacTech 25 as the result of a tragic accident while he was on a business trip in Tokyo. Michael was the author of *Essential Mac OS X Panther*



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Server Administration from O'Reilly, which I consider not only *the* best Mac OS X Server book in existence, but also the product of a mind that understood Mac OS X Server (from an integrator's viewpoint) better than anyone else I knew. Michael answered everyone's questions on many listservs. He also lived hard and played hard, liked to eat chili after a night out on the town and had a Powerbook with so many dents and dings in it that it looked like he'd used it as shield to protect himself from a rockslide. If the MacTech 25 had started in 2002, Michael would have made the list even then. There's no doubt he would have made the list every year for as long as he wanted his knowledge to stay relevant, and if you knew him, you'd know he would've done anything to stay ahead of the curve that he helped create by playing a major role in the creation of Apple's Mac IT Training curriculum as an Apple Certified Trainer as well as the ACSA certification exams themselves. Michael was only twenty-eight when he passed, but he was lucky to discover his calling at an early age. He was our Mozart, and Mac OS X Server was his instrument.

Member of: the new guard, the authors, the hackers, the teachers

DrunkenBatman

The Batlight Is Lit

A year and a half ago, when Macs with Intel processors were just a glimmer in the eyes of rumor-mongers, a product appeared

which titillated many of us. It was called CherryOS, and claimed to allow the owner of a PC to install and run Mac OS X in a virtual machine. Upon cursory examination, it became obvious that CherryOS contained unacknowledged code from PearPC, a popular open-source project. Enter Drunkenbatman, blogger supreme. Already known for organizing online events such as the RSS roundtable through his blog <http://www.drunkenblog.com>, he put together an online exposé of Maui-XStream (the company behind CherryOS) that is simply amazing in scope and breadth, as it not only follows the story to Hawaii, but also to India. Drunkenbatman also specializes in-depth interviews with other members of the "indie" Mac OS X Developer community. In October of 2005, he organized the amazing "Evening at Adler" in Chicago, attended by Mac OS X technologists from all over the country. Among those in the MacTech 25 featured in the event were Wil Shipley, Jonathan "Wolf" Rentzsch, Brent Simmons, and Rosyna Keller. Lately, though, Drunkenbatman or "DB" as he's sometimes called, has simply vanished, leaving a blank white page on his blog. We've left the Batlight lit, because we want him to come back. No questions will be asked.

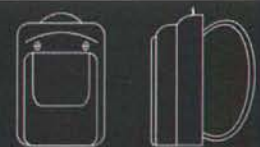
Member of: the new guard, the press, the hackers

Mike Breeden

Because Everyone's a Hotrodder at Heart

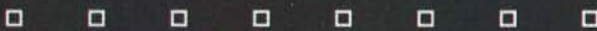
Without hardware, where would we be as Mac users? It's sometimes easy to overlook (not so easy to overclock), while

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trying to wrap one's head around the complexities of the various layers of Mac OS X, just how important (and fun) Mac hardware can be. From the challenges of flashing off-the-shelf video cards to the teeth-gnashing quest to find a SCSI adapter for under \$1000 dollars, to finding out just which G3 and G4 processor upgrades perform the best, how to replace your Core Duo or get rid of that yucky thermal paste, www.xlr8yourmac.com has been the place to go to read about others' experiences before plunking down your dough. Mike Breeden is the one who's runs the show of this Mac technical megasite that's been going strong since 1997.

Member of: the new guard, the old guard, the press

Nigel Kersten

Under the Hood Down Under

There's few Mac OS X admins that tackle problems with the skill and ingenuity of Nigel Kersten, who is the Senior Technical Officer for College of Fine Arts at the University of New South Wales, in Sydney Australia. Recently, Nigel wrote a revealing article on AFP (Apple Filing Protocol) for <http://afp548.com> that investigated the nuances of the tweaking the AFP client and optimizing AFP server performance through tuning kernel parameters and redirecting home directory caches to the local hard disk. His recently released application, Sir Admin, provided the first GUI for the relatively complicated cyradm ACL manager for Cyrus (the imap/pop mailbox server for Mac OS X). Nigel has also kept the admin community on its toes with scripts for home directory quota management and even relocating portable home directories to another partition so that laptops can be easily re-imaged without losing user data.



Member of: the new guard, the hackers, the teachers, the press

Ray Barber

Your World Scripted!

There are proprietors/founders of many online communities represented in the MacTech 25: afp548.com, www.xlr8yourmac.com, macfixit.com, macosxhints.com, and macintouch.com. I will however, admit that my favorite, at least for the past year, has been Ray Barber's Macscripter.net. Many communities help out with the "how to" portion of things by posting articles or examples, but Macscripter.net is inhabited by so many skilled and helpful scripters that one could almost write a complex and full-featured AppleScript or AppleScript Studio Application just by posting a series of the proper questions in the right sequence on the MacScripter forums. Because people share "snippets" of actual code, for the most part,

you're always closer to the answer than you think, and sometimes just a heartbeat away from a breakthrough. Recently, Ray built on his success with Macscripter.net by launching a new project: <http://macdeveloper.net>, a "marketplace for businesses to post outsourced projects to a pool of quality Mac developers in a reverse auction styled environment."

Member of: the new guard, the old guard, the teachers

Ric Ford

The Human Touch

Another proprietor of a successful online Mac technology community is Ric Ford, of <http://www.macintouch.com>, which has been in publication since 1994, making it one of the oldest Mac megasites in existence. Cleverly, Macintouch still relies on a very old model to keep itself interesting and fresh: it "takes" news from its own readers by email submission, then posts that news, opinion, or review by simply stating: "Macintosh reader so-and-so notes that. . . ." followed by the text of the email. In these days of RSS feeds, syndication, banner ads and those awful unsubtle "IntelliTXT" ads with the double-underline, Macintouch.com captures the essence of community without the bells and whistles, gizmos and gadgets, with no frills and an editorial touch for elaboration by juxtaposition, rather than by exposition. By simply placing news submitted by actual Mac users in carefully organized and timely topics, Macintouch makes magic for its readers every day, without trying too hard, and with the guiding touch of *real human beings*.

Member of: the new guard, the old guard, the press

Rich Siegel

Software That Doesn't Suck

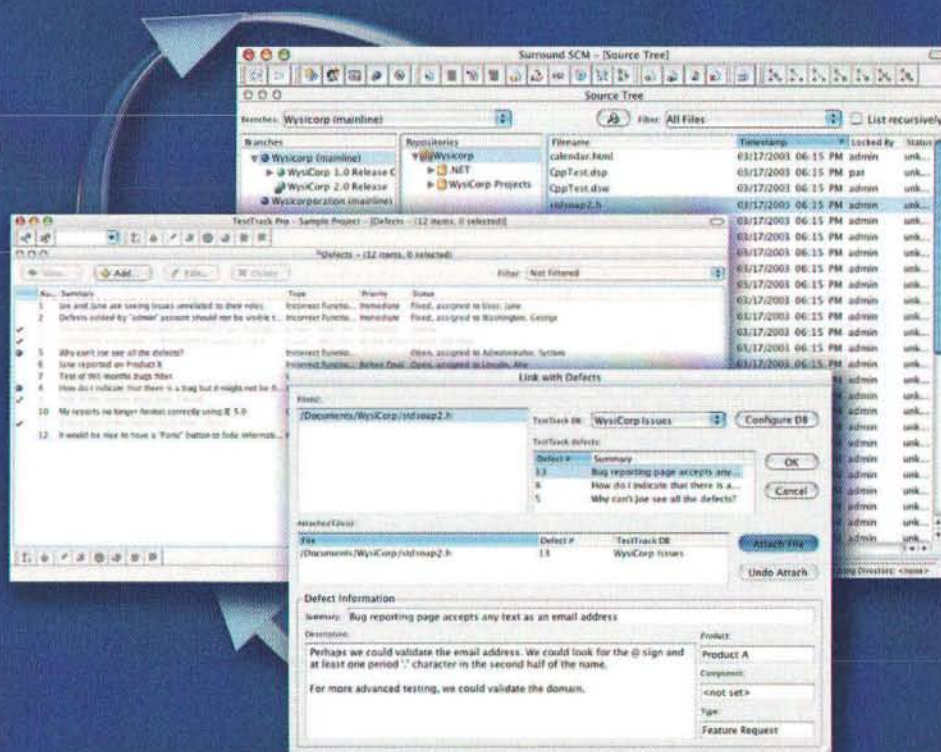
BBEdit (www.barebones.com)

is has been/still is the editor of choice for so many Mac programmers, web developers and scripters that it's literally as legendary as the Clarus the dogcow. If you don't know what "moof" is or have never heard of Clarus, then you have as little a chance of being a old guard Mac professional as I (in my early 40s) have of learning to shred on a snowboard or grind down a handrail on a skateboard. BBEdition was one of the first *interactive* editors. You could, for example, open a web page directly from a site, edit it, save it in place, and see the results immediately, with the ease of using an FTP program, rather than stepping through screen after screen of a convoluted site configuration wizard. Today, BBEdition not only previews HTML pages, but will also preview the results of a shell script or scripts in other interpreters, all the while keeping the



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list of files you're working on in a handy drawer, also providing a unique command-line to GUI bridge that allows sysadmins to edit UNIX configuration files in place. It also still gracefully mediates the sometimes difficult collisions of linefeeds and linebreaks, the old way of doing things and the new. Oh, it still zaps gremlins.

Member of: the new guard, the old guard, the coders

Rob Griffiths

I Haven't Tested This One Yet

Another beloved Macintosh online community is <http://www.macosxhints.com>, which, like Macintouch, is powered by contribution from readers, but with a unique twist: readers submit a "hint" which can take the form of a power user tip, a low-level hack, or even a script in just about any language. The objective(s) are obvious—learn your Mac, enhance your Mac, extend the functionality of your Mac, learn to do something on your Mac in a whole new way. As you can imagine, it can be crazy trying to keep over *eight thousand* individual hints organized by category and type, not to mention by version of Mac OS X. Rob Griffiths has not only manages the circus, by has *mastered* the circus of MacOSXHints and even takes the time to test the individual hints himself, while writing a column for MacWorld and his own blog <http://www.robobservatory.com>. Also, some knowledgeable web developer types secretly blame Rob

for elevating Geeklog, the content management system which powers Macosxhints.com (and now afp548.com) to somewhat mythical status.

Member of: the new guard, the hackers, the press

Rosyna Keller

Userland Heir Apparent

There are certain people that make themselves valuable through their posts on other people sites, and Rosyna Keller is one such person. At this time, it's also unclear as to whether or not Rosyna occupies the same plane of existence as the rest of us. It seems that Rosyna has some sort of professional relationship with the good folks at Unsanity (<http://www.unsanity.com>) the creators of the APE Application enhancement system, is credited with writing specific Unsanity applications. To quote Drunkenbatman of drunkenblog.com about Rosyna's appearance at the Evening at Adler: "It's really, really hard to describe The Rosyna, but I suppose "Anime-loving, sexually-androgynous opinionated programmer for Unsanity, currently responsible for FontCard, Silk, Menu Master, CEE PEE YOU, etc." might work." If there's some common-sense spankin' to be done to a blogger or comlunist out there, Rosyna's there to do it.

Member of: the new guard, the modders, the coders

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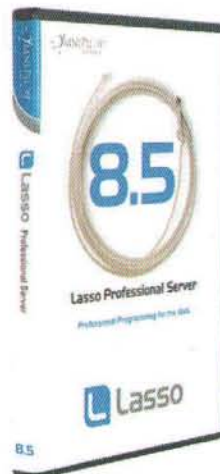
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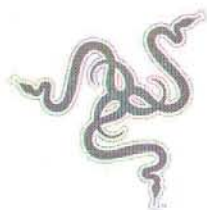
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Scott Knaster Clever Quipper Here

No matter your entry point into the world of Macintosh, you've come across Scott Knaster's influence. Jack of all trades, master of all, he's written or co-authored dozens of books on wide-ranging Mac topics. Turns out, they typically turn into Mac best sellers too. A former Apple employee (from the 68000 days), Scott has a wealth of anecdotes from his contacts too numerous to imagine. Let's put it this way – Scott may be the only person to have held positions at Apple, General Magic (!) and Microsoft for at least 5 years each. Of course, he is so widely recognized because he brings his infectious humor and charm to every task he undertakes. If you're looking for Scott these days, you'll find him writing even more books, speaking at MacWorld, and enlightening us with random life tidbits at his blog (<http://foodisworse.typepad.com/this/>). Scott influences just about everyone in the Mac community either directly through his writing, teaching and speaking, or indirectly through his vast array of contacts in the Mac universe.

Member of: the old guard, the new guard, the hackers, the coders, the authors

Wil Shipley Pimp My Code

Anyone making a list of the top ten Cocoa programmers outside of Apple would have to include Wil Shipley, who founded the OmniGroup and now founder of Delicious Monster, maker of the Apple-Design-Award-Winning (2005 Best User Experience) Delicious Library, which, among its dozens of amazing features, uses an iSight camera as a bar code scanner. Wil lives in Seattle, drives a red Lotus Elise, and in addition to Delicious Monster (www.delicious-monster.com), also runs a site called "Pimp my code" where he shares his deep knowledge of Cocoa with anyone who cares to read it: <http://wilshipley.com/blog>, and it's good reading—witty, interesting, full of history and time-saving wisdom. Wil's won a total of seven Apple Design awards, the equivalent of the Academy Award for Mac OS X programmers and is a role model for several generations of aspiring Cocoa programmers, even though he probably wouldn't want to be one. Wil gave an inspirational talk to students at WWDC 2005, participated in Drunkenbatman's Evening at Adler, and started programming using Project Builder for NeXTstep in 1989.



Member of: the old guard, the new guard, the hackers, the coders, the authors

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Honorable Mentions

Dave Mark Spider Man

If you've been around the Mac long enough, you may remember some of the early Mac programming books—few and far between, with good ones being even more rare. You may also remember that more than one was written by Dave Mark. The popular “Macintosh Programming Primer” series was one of the first books many Mac programmers of today remember picking up. If you're new to the Mac, you may have purchased an e-book from Spiderworks, Dave's new publishing company formed along with Dave Woolridge. Spiderworks' books cover topics relevant to the Mac today, webbing-in authors old and new, including titles from Dave himself and Danny Goodman, just to name a few. Dave's influence is evident from the top-notch authors he draws upon to write relevant material that teaches the new generation of Mac hackers.

Member of: the old guard, the authors, the teachers, the press.



Joel Rennich Trolling for Servers

A common thread amongst the honorees here is their willingness to share their knowledge. In 2002, Joel set up an entire site to do just that. Helping to “change the world, one server at a time,” afp548.com is the destination for frustrated OS X server admins everywhere. A former photographer at United Press International, Joel left his post to form his own consulting company where he spread his Mac OS X Server experience as a travelling Apple Certified Trainer. After tackling deep and esoteric issues on [afp548](http://afp548.com), his high profile landed him a new job as a Consulting Engineer with Apple Computer. Joel travels the world to set up and secure new networks as well as and rescue existing ones. Of course, he continues to share tips, scripts, and answers questions at [afp548](http://afp548.com) using his handle, MacTroll. Joel has helped introduce many Mac OS X sysadmins to pushing the bounds and not simply relying on the stock tools that Apple provides.

Member of: the new guard, the teachers, the press

John Welch That's Not Going to Work

Some people just seem to be everywhere you turn. Omnipresent, if you will. John Welch fills that role in the Mac community, and is a talent writer with a unique penchant for pointing out the sometimes asinine assumptions certain computer companies (Apple, Microsoft) make in their corporate computing strategies. A strong presence on the Mac OS X Server list and the Mac Enterprise lists, John also writes for MDJ, IT Enterprise, MacTech and maintains his own blog at bynkii.com and is a regular speaker at MacWorld. John approaches all of this with a practical, common-sense style, and the ability to drop his opinions like precision-guided missiles cultivated, perhaps, in his 6-ish years in the US Air Force. All this and he manages to keep up with the demands that overseeing IT operations for Kansas City Life Insurance place on him. You'll see John's influence clearly in long threads on mailing lists where his well-reasoned comments sway more than a few to see things his way, or at least be open to new opinions. Oh, and did I mention that he hates Star Wars with a vengeance? Hates it, he does.

Member of: the old guard, the new guard, the press, the authors, the teachers.

Mike Bombich Owns IT

If anyone “owns” Mac IT, it's Mike Bombich. While other sysadmins have dabbled in AppleScript Studio to make simple graphical interfaces for scripts, his backup and cloning utility, Carbon Copy Cloner may have been downloaded nearly one million times, and works amazingly well for end-users and sysadmins alike. His other major project, NetRestore, which started out as a simple front end for slinging ASR images over Netboot, has become a rich

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mass deployment and computer management system that recently gained the capability of imaging dual boot computer labs. NetRestore as also become one of Apple's worst-kept secrets—shunned from certification curriculums and the Mac OS X Server Admin Guide, it is simply used by everyone. Mike also shares his source code, which has been invaluable for AppleScript Studio programmers as a reference of how things “should be done.” And, if that weren't enough, he also publishes some of the most widely read technical articles and hosts the premier community focused on Mac OS X Deployment at <http://www.bombich.com>. For the last four years, Mike has worked for Apple, while remaining amazingly productive at his “hobby,” all at barely thirty years old, if that.

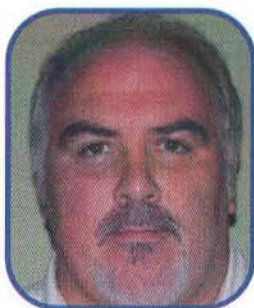
Member of: the new guard, the coders, the hackers, the teachers

Schoun Regan Teaching Old Dogs New Tricks

Seems to be that people either know of Schoun, or they don't. In either case, you've probably been downstream of his influence in one manner or another. Unlike some others in this list, outside of a post here or there, he's not very active on mailing lists. Nor has he set up a web presence that aims to give you every detail about the Mac. However, that is more than made up for in his speaking (MacWorld, WWDC, MacRetreats, etc.) and authoring and editing (Peachpit's Visual Quickstart, Apple's Pro Training series, articles for MacTech and others). Also, you may have taken one of the many Apple certification courses that he teaches as CEO of his training company, IT Instruction (<http://www.itinstruction.com>). Sound busy? You bet! So, if you're Schoun, what do you do with the slices of non-work time? “Cleveland is my home. Outside of the Mac community, I lead a quiet, simple life. I enjoy my family and watching baseball. I've been to most of the stadiums across the United States and Canada in my travels. Cleveland still has the best park for Baseball (Jacob's Field).”

Tim Monroe Time Master

Some people go broad with their skill-set. Others go deep into one. When it comes to QuickTime, Tim sits in the latter category. A sixteen-year veteran of Apple Computer, he holds the position of Senior Software Engineer in the QuickTime group. A frequent speaker, author of two books, *QuickTime Toolkit, Volume One*, and *QuickTime Toolkit, Volume Two*, you'll also find Tim fielding questions from beginner to advanced on many lists, Apple and third party. Prior to his programmer role, he authored several of the



original “Inside Macintosh” series of books – serious exercise material. If you need to wrap a streaming Flash-based audio sample in QuickTime and display it through your Cocoa or Carbon app, Tim can surely point you in the right direction. Since QuickTime is a cornerstone of the Mac experience, Tim holds an important place in our list: by guiding programmers old and new in the ways of QuickTime, he ensures that we'll all see more of the media-rich applications that we're accustomed to and rely on.

Member of: the old guard, the coders, the press, the teachers



About The Author



Dean Shavit is an ACSA (Apple Certified System Administrator) who loves to use a Mac, but hates paying for software. So each month he's on the hunt for the best Open-Source and freeware solutions for OS X. Besides surfing for hours, following the scent of great source code, he's a partner at MOST Training & Consulting in Chicago, where he trains system administrators in OS X and OS X Server, facilitates

Mac upgrade projects for customers, and writes for his own website, www.themachelpdesk.com. Recently, he became the surprised father of an application: Mac HelpMate, available at www.machelpmate.com. If you have questions or comments you can contact him: dean@macworkshops.com.

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MAC IN THE SHELL

by Edward Marczak

GUI-up your Script

OK – Perhaps the GUI is nice every now and then...

Introduction

While I can extol the virtues of life in the shell, I do realize that sometimes, just sometimes, a GUI is more appropriate. Why would I say such a thing? Because there will be scripts that you write primarily to be used by other people. The kind of people that don't keep a terminal window open 100% of the time. On one hand, you've found a great solution to their issue. On the other, you don't want the cure to be more painful than the disease. The wonderful thing about Apple's XCode development environment is that you can take practically *any* shell solution and turn it into a GUI-based one without too much effort. That's where we'll be heading this month.

What's New in AppleScript

Did I just say *AppleScript*? Yes, yes I did. The history of AppleScript is outside the scope of this column; it is very lengthy. It is now, however, a *mature* technology. Even more exciting is the inclusion of "AppleScript Studio" into OS X and XCode.

Now, you won't find an application, or even a submenu that launches anything called "AppleScript Studio." AppleScript Studio refers to the ability of XCode to take an AppleScript app, tie it into all of the other XCode technologies and compile it into a native Cocoa app. This makes creating a basic application mind-blowingly simple. We're going to create a small sample app to prove this.

Fire Up XCode

If you've never launched XCode, now's your chance to dig in. If you're an XCoder already, you may have missed (or

ignored) some of the AppleScript options. More importantly, if you've never *installed* XCode, you'll need to for the rest of this article. While the XCode environment ships with each copy of the OS, the retail disc is a little dated at this point. Bring yourself to <<http://developer.apple.com>>, sign up for a free account, and download the latest version of XCode (2.3, as of this writing, weighing in at 915MB).

With XCode installed, it's time to launch it. You'll find it at /Developer/Applications:



Figure 1: XCode icon

You may not notice that it's up and running. In its minimalist way, there's no splash screen or other trumpeting of its arrival. Choose New Project from the File menu:

File	Edit	View	Format	Fi
New Project...				⇧⌘N
New File...				⌘N
New Empty File				⇧⌘N
Open...				⌘O
Open Quickly...				⇧⌘D

Figure 2: New Project

When presented with the choice of the kind of project, choose "AppleScript Application" and click "Next". Name your project – the example this month is "Backup", if you're following along – and where you want it saved. XCode will create directories for you if necessary. Once you give it the go ahead, you'll be staring at a fresh new project.

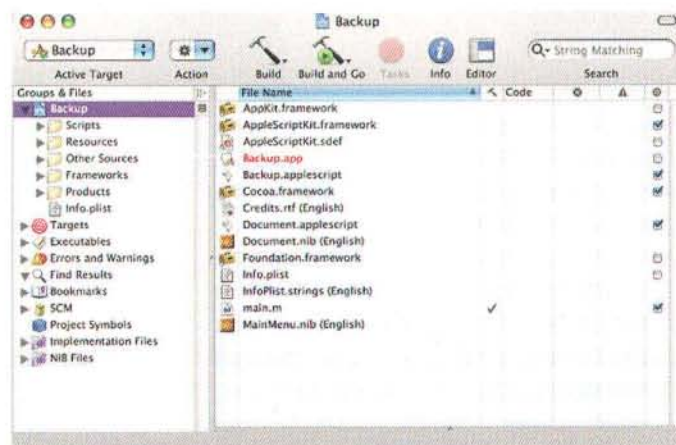


Figure 3: Default Project

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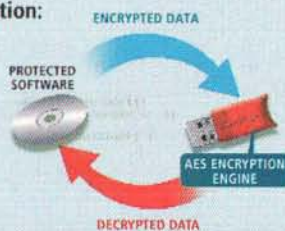
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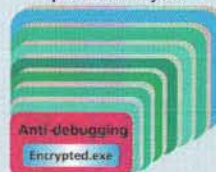
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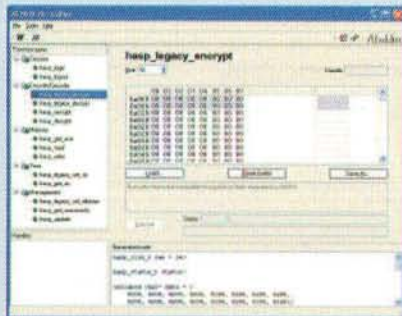
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Category	Weight	Aladdin HASP HL	Sentinel UltraPro
Security	35%	85.1%	60.9%
Ease-of-use	25%	93.7%	77%
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Flexibility of tools and functionality	10%	93.3%	71.2%
Compatibility across platforms and environments	10%	93.3%	71%
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Lot of stuff – stay cool. In the “Groups & Files” pane, you’ll see a ‘Scripts’ folder. Since we’re going to be writing an AppleScript that will front-end a shell script, as you can imagine, this is where the bulk of the action will take place for us. Of course, we need to begin at the beginning. Let’s write the shell script.

The Heart of the Matter

The real work will be done by a shell script, so we need to have that in place. This will be a ‘lite’ version of a solution I really have put in place. However, there were enough things that were specific to the environment in question, that I don’t want to reproduce here. Additionally, I won’t be getting into any heavy error checking or correction. Nor will I make the claim that this is a perfect fit for any other particular situation. That said, I’ll offer this basic script as our base:

```
#!/bin/bash  
  
ditto -rsrc /Files /Volumes/Backup_Drive/Files
```

This one-liner uses the OS X native ditto command to copy all files from /Files to /Volumes/Backup_Drive/Files. I’ll stick the ‘-rsrc’ switch in there as it only became the default behavior as of 10.4. What if we want to run this on a Panther machine? Use your favorite text editor to create this script, and then save it. Call it “backup.sh”. Mark it executable with `chmod 770` and test it. You may need to modify the path names, or, for testing purposes, simply copy between two folders on your local drive.

Have it working? Great. Now, we can drag-and-drop this script right into our XCode project. Locate this script in the Finder, and drag it into the Scripts folder. You’ll be asked how to reference this file. Ensure that the “Copy items into destination group’s folder” is checked, and click add.

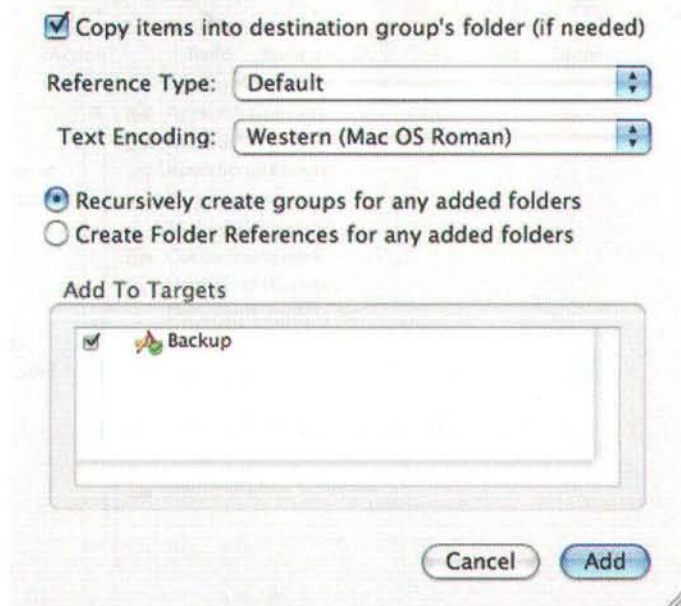


Figure 4: Copying a script into XCode

You should see your backup.sh script listed alongside the preloaded AppleScript file. Like so:



Figure 5: Your script has been added

If you’ve never used XCode before, please do this now: click on the **build** icon in the toolbar. This will help you understand how XCode lays out your project. Open up the folder where you saved this project. Inside, you’ll find a folder named ‘build’. Inside of that, you’ll find one named ‘Debug’, and it will contain your Backup.app. See how easy that was? OK, not so fast, right? Although this app actually will run (go on, try it), it won’t do anything of use. Right-click (control-click) on the app and select “Show Package Contents”. Open the resulting ‘Contents’ folder, and the ‘Resources’ folder beneath that. You should see three objects: backup.sh, English.lproj and Scripts. Well, there’s our ‘backup.sh’ file! Now we know where it lives and how to access it.

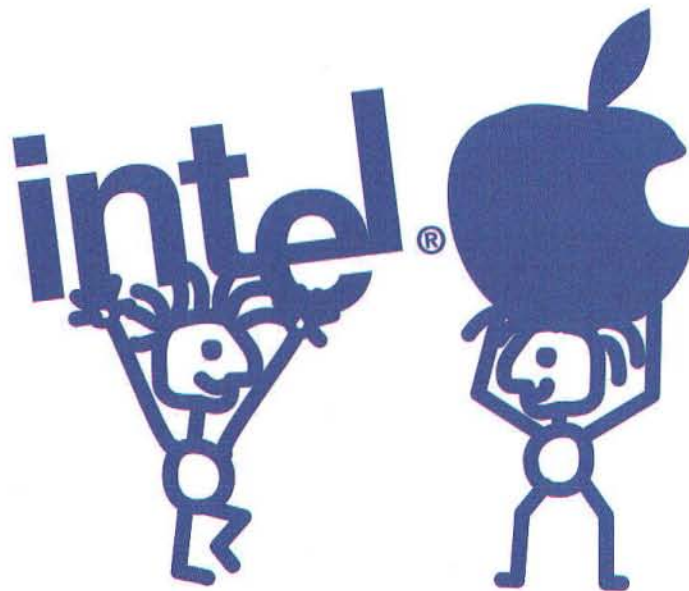
Get GUI

Back in XCode, toggle the disclosure triangle next to the ‘Resources’ group. Double-click on the ‘MainMenu.nib’ file. This will launch Interface Builder, and even *more* windows will now litter your screen. Click once on the window labeled ‘Window’. Let’s immediately name it something more relevant. Change the Window Title in the inspector pane, and title the window “Backup”. Also, we need to give it an AppleScript name. Change the drop-down menu in the inspector to “AppleScript”. Name the window “wMain”. Now, look for a button in the ‘Cocoa-Controls’ pane. Drag it to the lower right-hand corner of our window. You’ll see guidelines appear to help you position it. With the button still selected, let’s make it say and do something appropriate. Back on the attributes screen, update the button title in the inspector pane. (Change the drop-down menu to get back to the attributes screen). Additionally, change the ‘Key equiv.’ to ‘\R’ – type it in or use the drop down menu to select ‘Return’, and check the ‘Selected’ checkbox. Flip the inspector back to AppleScript, and give this button a name. How about “bBackup”?

Now to begin to tie it together: Making sure that you’re still in the AppleScript portion of the inspector, place a checkmark in the ‘Action’ box, and select the ‘Backup.applescript’ in the list at the bottom of the Inspector. Save and quit. Not too terrible, right? Of course, now we have to make that AppleScript *do* something.

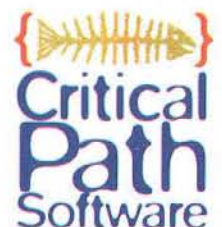
I am not, nor will I pretend to be an AppleScript guru. I can deal with the basics well enough, and they *are* easy to pick up.

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However, once you start doing this, and you get hooked on it, do yourself a favor and hit some of the many fine AppleScript resources available. This includes Ben Waldie's AppleScript column right here in MacTech. He's also written some excellent books, available through SpiderWorks (<http://www.spiderworks.com>). There's also <http://www.macscripter.net>, another web-based resource. However, to simply front-end a shell script – no matter how complex – you'll find all you need in this one column. Just do realize that you can do some very complex scripting with AppleScript, and in an all Mac environment is well-worth learning.

With that out of the way, let's continue. Back in XCode proper, double-click on the 'Backup.applescript' in the 'Scripts' group. You'll see that XCode give you some pre-populated **comments** for you to tailor to this project. But comments don't cause any action! Place these lines into the script:

```
on clicked theObject
    - setup
    set myPath to POSIX path of (path to me) as string

    - Do it!
    do shell script quoted form of myPath &
    "Contents/Resources/backup.sh"
end clicked
```

As you type this in, all text will be set in a purple mono-spaced font (by default, anyway – you may have changed this preference). Once you save, the parser comes alive to check the validity of the script. Valid strings and recognized keywords get color-coded and set in a different font. What did we just tell our application to do? **Actions** performed on the button will be sent here since we used Interface Builder to tie an action to this particular script. In this case, we're interested to know when someone clicks on the button.

The first line (set myPath...) sets the "myPath" variable to the path of the application. This lets the user place this app wherever they want on their file system, and we can deal with it at runtime. Next, we call our shell script. AppleScript gained the ability to call scripts with the "do shell script" command. Currently, we know where our app lives and have stored that in a variable, myPath. Earlier, we verified where our script lives inside our application bundle. Now we know where to go relative to the app. We can launch our script from the "Contents/Resources" folder below "myPath".

Is it really this simple? Let's find out. First: go load up your /Files directory with some files and folders. Then, back in XCode, click on the "Build and Go" icon in the toolbar. A build window will appear and give you build status. Once complete, you'll see the window that we created earlier in Interface Builder with its one lonely button. As you can see, it is the default button, and has the Aqua default pulsing glow. Go ahead and click the "Backup" button. Our app will run our shell script buried in the application bundle. Depending on how much stuff you loaded into the /Files directory, this may take a minute. Do notice, though, that while the underlying script is running, the button stops pulsing. Once the script finishes up, the button will pulse again. Press Apple-Q or select "Quit NewApplication" from the "Backup" menu.

The answer, then, is "yes! It *is* that simple." Of course, not only did we not write a very friendly application, there are some other things we need to take into consideration. However, if all you ever want is a one-button method of running a shell-script, now you have the framework to do so. This isn't anything I'd hand a client, of course.

Version 1.1

Before I continue to spill letters onto the page, there's a much more important source before we continue. "do shell script" is addressed in detail in Apple's Technote TN2065. This is a **must read**. URL in the references at the end of this article.

Moving along, we need to create better feedback for the client when they run our application. Double-click on the MainMenu.nib file once again (in XCode). You should see our application's window displayed by default. If not, double-click the "Window" icon in the "MainMenu.nib (English)" window. Drag a progress indicator from the Cocoa-Controls window onto our main window – place it just above the backup button, and stretch it horizontally to the width of the window. Then, with it still selected, change the drop-down menu in the inspector to "AppleScript". Give this control a name...like, "pMainProgress". (I used to code in VB and RB and, yes, Hungarian notation is driven pretty deep into my brain). We need this name so we can refer to the control in code. Save and quit Interface Builder.

Once again, we're in the position of writing code that will actually make that progress bar *do* something. Fortunately, AppleScript makes it pretty trivial. You'll see why we need to name objects so AppleScript can reference them. Here's one of the lines we'll need to add:

```
set uses threaded animation of progress indicator
    "pMainProgress" of window "wMain" to true
```

(While this may wrap in print, you should type it as all one single line with no line break).

Since we can have multiple windows, each with multiple progress bars and other objects, we need to be specific. We need to set the "uses threaded animation" property of the progress bar. Ah, which progress bar? The one we called "pMainProgress". Well, on *which* window? "wMain"! AppleScript's goal of being English-like works in its favor most of the time. Other times, you can get some pretty bizarre sentences. We'll place all of our code right in the on clicked section, because we only want the progress bar to animate while the backup is running. The fully updated code follows (and look for the start *and* stop of the progress bar):

```
on clicked theObject
    - setup
    set myPath to POSIX path of (path to me) as string

    - Start progress bar
    set uses threaded animation of progress indicator
    "pMainProgress" of window "wMain" to true
    tell progress indicator "pMainProgress" of window "wMain"
    to start
```




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```

- Do it!
do shell script quoted form of myPath &
"Contents/Resources/backup.sh"

- Stop progress bar
tell progress indicator "pMainProgress" of window "wMain"
to stop
set uses threaded animation of progress indicator
"pMainProgress" of window "wMain" to false
end clicked

```

(Again, these lines wrap in print, but they should not be artificially broken when *you* type them).

Our progress bar commands "wrap" the do shell script. Time for the test: Apple-S (save) and Apple-R (build and **Run**). Make sure that your source folder is populated, and click on "Backup". Progress bar moves while it's working, and stops once it's done. Fantastic.

What if there's a problem? We really want to trap for errors. Change the "Do it" section to read thusly:

```

- Do it!
try
do shell script quoted form of myPath &
"Contents/Resources/backup.sh"
on error number 255
display dialog "Sorry, an error occurred. I can't make
the copy."
end try

```

As you can surmise, this allows us to *try* a command that may fail, without bombing out – we get to control the process. Here, I show a basic *try block*. We try to run the script. If it runs properly, returning a zero, all's good and we continue on. If there's a

problem, we show a dialog box that explains that there has been a problem. Try blocks can certainly get much more elaborate.

What might be a reason that we'd have an error in our script? Perhaps we're asking it to backup areas of the file system that we don't have access to? In that case, you can have your script run with administrator privileges. You do this with the....wait for it...."with administrator privileges" parameter. Alter the do shell script line to read like this:

```

do shell script quoted form of myPath &
"Contents/Resources/backup.sh" with administrator privileges

```

By itself, with no additional parameters, this will present the user with the familiar dialog box asking for an admin password when the app is run.

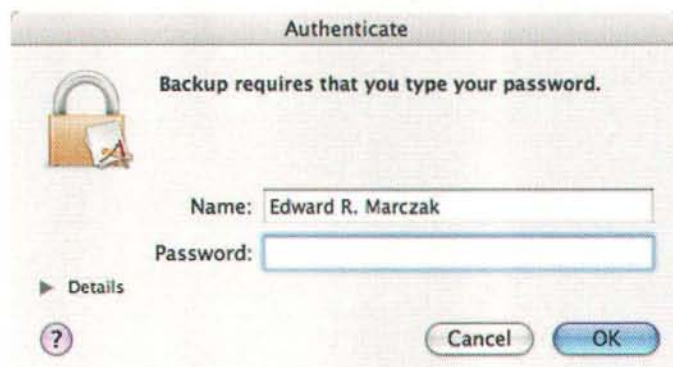


Figure 6: Our app asking for authentication



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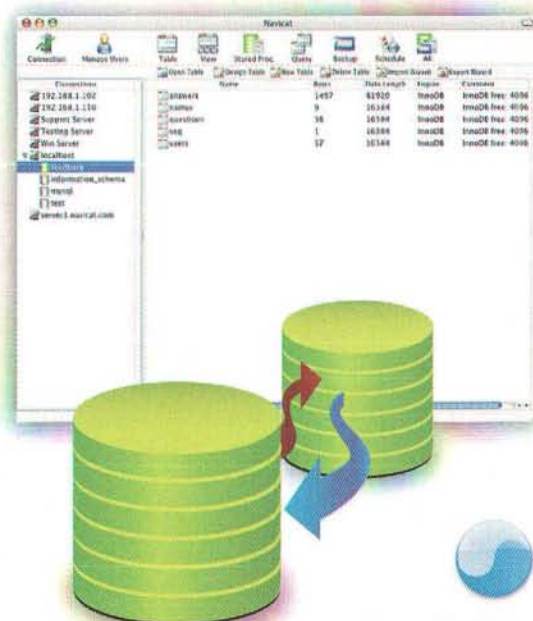
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You *can* preload your script with a username and password. However, I DO NOT RECOMMEND THIS. Clear? To tie this back into last month's column, it would be trivial for someone to run strings across the resulting binary and gather the admin level id and password you provided. If you're daring enough to risk it, find the instructions in the Apple 'do shell script' technote referenced earlier (but seriously: don't).

One little thing that TN2065 does *not* mention: there is a default timeout on all AppleScript commands, including `do shell script`, of two minutes. If you believe your script may run for longer – for whatever reason – use a `with timeout` block:

```
with timeout of 300 do
  do shell script ...
end timeout
```

Unfortunately, there is no setting that will just let it do its thing indefinitely (OK, perhaps not a terrible thing). If a command does timeout, a timeout error is thrown (-1712). So do make sure you use a value large enough to let your script run to completion. Even if that's "99999".

One for the road

We'll add one more object to our window: A text field with the current status. Double-click on `MainMenu.nib`, and once Interface Builder is running, click on the Cocoa-Text icon in the object palette:

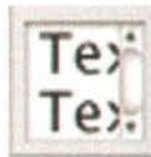


Figure 7: Cocoa-Text icon

Drag two "System Font Text" fields to the main window. Place one in the upper left (use the guides), and the second right next to it. Double-click on the first, and type "Status:" into the text field. Double-click on the second and type "Idle" into its text field. With the second still selected, Apple-8 your way to the AppleScript attributes, and name this field "efStatus". We should also clean this window up a bit while we're here, no? Drag the progress bar straight up until the guides appear under the text fields we just created. Do the same for the single button, and stop when the guides appear under the progress bar. Size the window itself appropriately, again using the guides. Save and quit Interface Builder.

Again, we need to make that text field perform an appropriate action. Here's how we can do so. In the "setup" section, add this line:

```
set the contents of text field "efStatus" of window "wMain"
to "Copying files..."
```

...and just after the try block, add this line:

```
set the contents of text field "efStatus" of window "wMain"
to "Backup Complete."
```

Save (Apple-S), build and run (Apple-R) the project with the changes. Nice.

Finally

Last thing I'll mention: If you really want to make this professional, you'll probably want to fix up the app menus to show the app's real name (not "New Application") and add a custom icon. Let's tackle the icon first. For this, you'll need Icon Composer. You'll find that with the developer tools in `/Developer/Applications/Utilities`. You'll need to have your artwork complete before using this utility – Icon Composer is *not* a drawing program. It will, though, read in Photoshop files directly. Drag your artwork to the 128x128 pane, scale it if needed. From there, drag the 128x128 to the 48x48, scale it and let the program extract the mask. Rinse and repeat for the last two sizes. Apple-S to save. Make sure "Save into bundles" is checked, and save the file. You can then take this file and drag it into the "Resources" section of the XCode project. Choose the "Project" menu and click on the "Properties" tab. Type in the name of your icon file (I left mine "icons.icns" in the example below), and as soon as you press return, you'll see a thumbnail representation of your application icon.

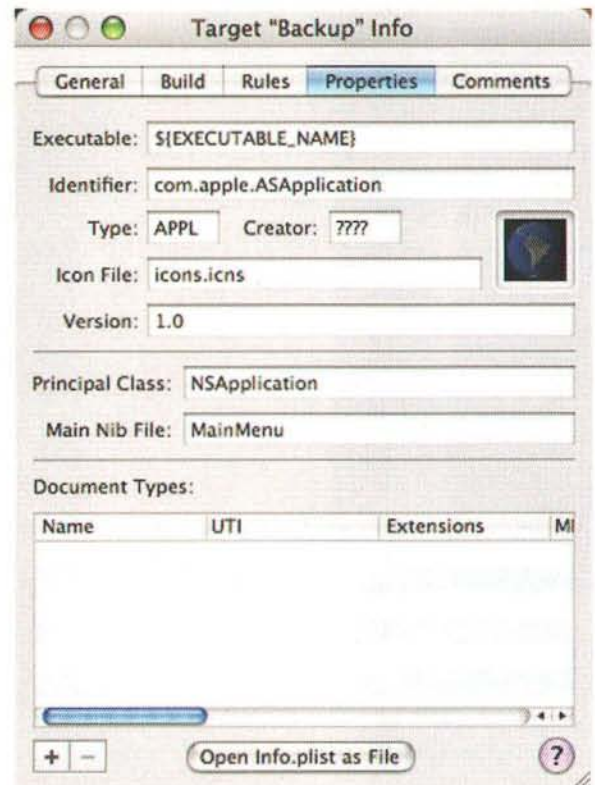


Figure 8: Project properties and setting an application icon.

To update the menus, we need to double-click on the `MainMenu.nib` once again and launch Interface Builder. You should notice a small menubar floating just underneath the window we've been editing. If not, simply double-click on the "Main Menu" icon in the main window of Interface Builder. Editing the menu is as simple as double-clicking on each item you want to rename. You can alternatively accomplish this with the inspector pane, but this method will update the inspector as well.

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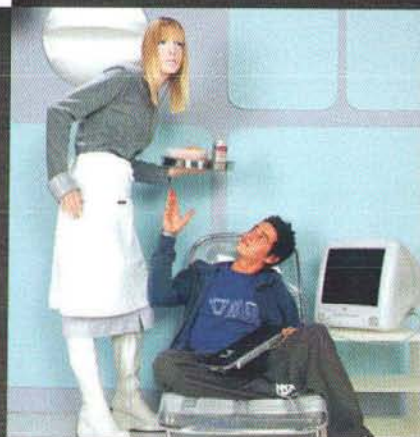


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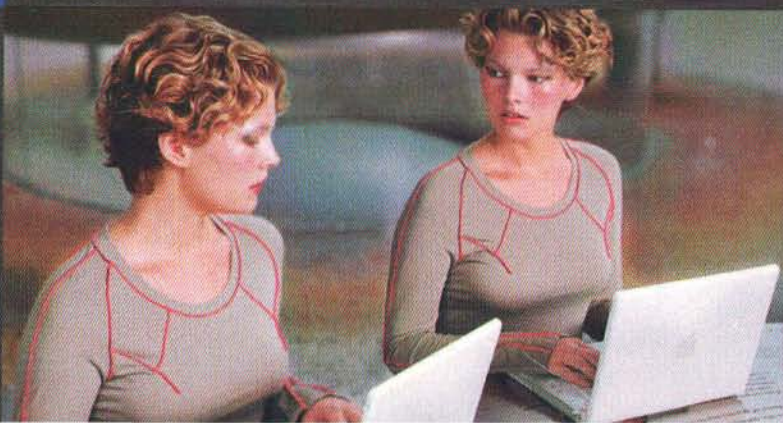


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Figure 9: Menu editing in action.

Quit and save. Let's build this thing into a 'real' app. In XCode, choose the "Project" menu, and then change the "Active Build Configuration" to "Release". Save and build (Apple-B) the app. The last line of the Build Results window will tell you where to pick up your Universal Binary application! Go get it and double-click to run. Exiting, huh? You can now distribute this application, and it contains everything that it needs to run – your shell script (the point of this entire exercise, remember) is bundled inside.

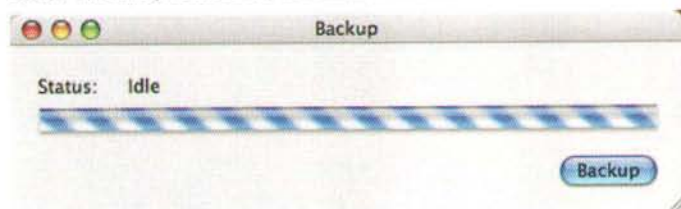


Figure 10: Our final application, running as a universal binary.

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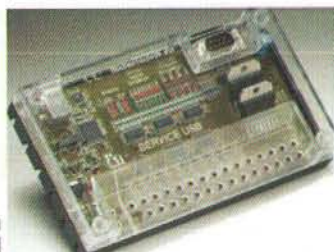
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Keep it simple

The goal of this article was to introduce the oft-overlooked capability to easily create a GUI for a shell script using tools that Apple provides for free. While many *are* aware of this capability, I find it "oft-overlooked" by shell scripters, anyway. As mentioned earlier in the article, this is certainly not an exhaustive look at everything you can do, nor does it even begin to approach "best practices" (such as exhaustive error checking in a try-block, creating a proper info.plist, or even dealing with script output). If this introduction intrigues you, there are many, many places to increase your knowledge and further this path.

While I realize that this will run very much after the fact, this publication will appear during WWDC, which will be less lively without Michael Bartosh. Friend, fellow tech, fellow author and more, he will be sorely missed. Let's all remember to raise a glass – even a virtual one – in remembrance. Speaking of WWDC, I'm present to raise a real glass with anyone interested. See you at Dave's.

Media of the month: I've been too tied up in Citrix tech docs and Microsoft Group Policy to recommend anything appropriate here from a technical perspective. Actually...that may provide the perfect segue: OS X provides Windows interoperability by using the open source Samba project. By itself, Samba is an ambitious and deep project. Cleverly, Apple provides O'Reilly's entire "Using Samba, Second Edition" preloaded onto your Mac! Launch Safari and point your browser to <file:///usr/share/swat/using_samba/toc.html>. This tends to be another 'oft-overlooked' resource.

I was fortunate to meet many MacTech readers at MacWorld in January, and I hope to meet more at WWDC 2006. If you're unable to attend, look for our reports from the show. In any case, I'll see you in print next month!

References

Just about everything at <http://developer.apple.com>

Especially Tech Note 2065: <http://developer.apple.com/technotes/tn2002/tn2065.html>

The Tao of AppleScript, Derrick Schneider (yes, this came out in 1994 and shipped with a floppy of examples. AppleScript basics just haven't changed *that* much).

Resources

Mac Scripter: <http://macscripter.net/>

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About The Author



Ed Marczak owns and operates Radiotope, a technology consulting company. Radiotope helps separate technology issues from policy issues, cool-tech from needed-tech. Guide your decision at <http://www.radiotope.com>



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Books and Stuff

Digital Media Boost With the Intel® Core™ Duo Processor



Extracting maximum performance from your applications

By Ron Wayne Green and Ganesh Rao

Introduction

This is the second part of a three part series that addresses the most effective techniques to optimize applications for Intel® Core™ Duo processor-based Apple Macintosh computers. Part one of this series introduced the key aspects of the Intel Core Duo processor and exposed the architectural features for which tuning is most important. Also presented in that first article was a data-driven performance methodology using the software development tools available on an Intel processor-based Apple Macintosh to highlight tuning and optimization opportunities. This article, the second part of this 3-part series, introduces the Intel® Digital Media Boost technology of the Intel Core Duo processor, its capabilities, and how a programmer can exploit this computing power. The final part of this three-part series to come in a future MacTech issue will provide readers with the next level of optimization - taking advantage of both execution cores in the Intel Core Duo processor.

In this article, we examine the Intel Digital Media Boost enhancements to the Streaming SIMD Extension (SSE) features of the Intel Core Duo processor. We also describe how to direct the Intel compilers to leverage these features for optimal application performance. Finally, we will examine inhibitors to the use of these advanced hardware features and how to remove some of these inhibitors. Examples will be illustrated with C++ and Fortran code snippets.

Goal: Integer and Floating Point Calculations

Before we dive into the details of SSE and Intel Digital Media Boost, let's understand our goals for this article. Reviewing our high-level diagram of the Intel Core Duo

processor, Figure 1, we see that the processor has two cores. Each core is a full-feature, tradition CPU which includes registers, instruction pipeline and execution unit, and advanced integer and floating point arithmetic units. Our goal for this article is to focus on a single core (either one as they are equivalent) and look at the hardware provided to accelerate integer and floating point calculations.

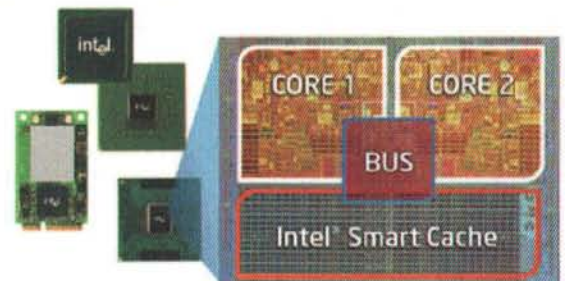


Figure 1: Intel® Core™ Duo processor architecture

SIMD: A methodology for performing calculations in Parallel

Single-Instruction, Multiple Data (SIMD) is a methodology for performing the same mathematical operation on a data set. Imagine that you have 1,000 elements in two rank-1 arrays, or **vectors** in mathematical terms, and you wish to add the elements of the arrays. Let's call the operand arrays A and B, and we wish to store them in a third array, C, as shown below:

```
real, dimension(1000) :: a, b, c
do i=1,1000
  c(i) = a(i) + b(i)
end do
```

Or the equivalent loop expressed in Fortran 90 array syntax:



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$$c = a + b$$

For this example, the "Multiple Data" the term SIMD are the 1,000 items in each array or vector. The "Single Instruction" is the addition operation that we wish to perform on the elements of A and B. With an infinite hardware budget, we could store the A operands in 1,000 registers within the core, store the B operands in another 1,000 registers, feed the registers in parallel into 1,000 addition units which perform the add operation, and finally feed the results of the 1,000 addition units in parallel to 1,000 storage registers - all of this in one instruction cycle. Ah, idealism! Reality is that our transistor budget on our current generation silicon does not allow parallelism on this scale. Also one has to remember that any registers you provide to user processes have to be saved off and later restored during context switching. Our goal is simple: We want to load our operands into register files, use parallel arithmetic units to operate on the operands, and feed the results into registers or to memory.

There is another term we need to understand before proceeding. **Vectorization** or **Vector Processing** is a term that has been used in high performance computing for many years. It refers to a technique to load a set of registers, sometimes called a register file, with operands. After the operands are loaded, a single instruction is used to perform a mathematical operation on the operands. This differs from SIMD in that the mathematical operation specified by the single instruction is performed by sequentially streaming operands from the registers through the arithmetic unit and back into registers - usually with one mathematical operation per clock cycle. In SIMD a single instruction operates in parallel on the dataset. In vector processing, a single instruction operates on the operands in a register file in rapid sequence.

Inherent in vector processing is the assumption that vectors are large. Therefore, caching of this data should be avoided. If cache were used as a conduit between memory and the register file, accessing a large vector would quickly fill the cache and it would spill without reuse of any element of the vector. Thus, large vector streaming memory access patterns see the cache as nothing more than useless overhead. For vector processing, direct memory-to-register or cache-bypass techniques and instructions are typically used. These streaming instructions are part of the SSE instruction set.

SSE is a hybrid of a pure SIMD model and a pure vector model. SSE uses vectorization techniques to stream data directly from memory to and from SSE registers (the Streaming component of Streaming SIMD Extensions). These SSE registers act as a register file. However, the SSE registers pack several operands into each 128 bit register and operate on them as a set in a data-parallel SIMD model (the SIMD portion of SSE). For the remainder of this article we will refer to the process of compiling code to take advantage of SSE as **vectorization**.

We need to stop at this point for an important consideration: These techniques are only **efficient** when an application has enough operands to make the setup costs

worthwhile. Setup costs include the time to load the registers with the elements of A and B from memory and the time to unload the elements of C from registers to memory. Looking at the DO loop above, if there are only 5 iterations of the loop (operations on just 5 elements in each of A, B, and C) then the setup costs may exceed the speedup benefit of using the SIMD and vectorization techniques. Also, a loop may not be efficient if it contains too many instructions or conditionals that will break down the vectorization within the loop. Loops without enough iterations or with too many expressions that will break down the vectorization are termed **inefficient**.

Streaming SIMD support in Intel Core Duo Processor

The Intel Core Duo processor supports SIMD and vectorization with dedicated registers, arithmetic hardware, SIMD mathematical instructions to operate on the data in the SSE registers, and streaming (cache bypass) memory load and store instructions. Each core of the Core Duo processor has its own dedicated SIMD hardware. Figure 2 illustrates the SSE hardware available in each core of the two cores in the Intel Core Duo processor. This hardware, along with the instructions that drive this special-purpose arithmetic resource is referred to as Streaming SIMD Extension, or SSE. SSE was designed and has evolved to accelerate integer and floating-point calculations. And while the intent of SSE was to accelerate common media operations, these same mathematical and data movement operations are applicable to a wide range of applications in technical computing, finance, signal processing, graphics, and gaming to name a few.

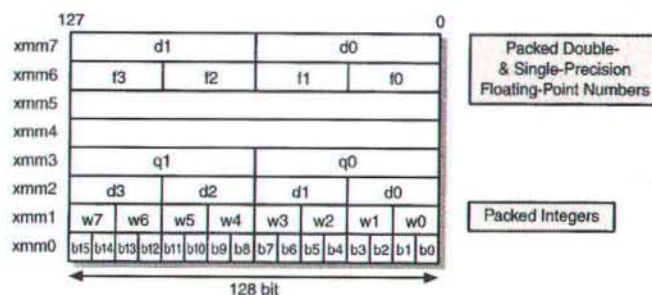


Figure 2: SSE registers and supported data types

SSE operands can be integer: from 1 byte through 8 byte integer types both signed and unsigned. Floating point data is supported in 32 or 64 bit IEEE format. As shown in Figure 2, the SSE registers are 128bits wide. Thus, these SSE supported data types are packed within the registers and operated upon in SIMD. Figure Operations on the data can be addition, subtraction, multiplication, division, and some transcendental functions such as sine and cosine.

A young boy stands in a vast, grassy field under a deep blue night sky filled with stars. He is looking upwards, his head tilted back. In the distance, a single tree stands on the horizon under a soft, glowing light source, possibly the moon or a distant star.

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Enabling Digital Media Boost Vectorization

The Intel® Fortran and C++ Compilers for Mac® OS allow the programmer to generate binaries that take full advantage of the Digital Media Boost technology. In fact, the Intel compilers will enable vectorization by default when the compiler is using optimization level 1 and above (compiler options -O1 through -O3). Let's look at how to enable vectorization with the Intel compiler from the Xcode environment. We assume that the reader has installed the Intel Fortran or C++ Compiler for Mac® OS and has read through the chapter *Build Applications with Xcode* in the Fortran or C++ Compiler Documentation. One suggestion: it is best to keep the settings for optimization only in the **Release** configuration for the target(s). Optimization settings can adversely affect the ability to debug an application.

The first step to enable vectorization is to choose an optimization level of 1 or higher (compiler options -O1, -O2, or -O3). Highlight the target for your project, select **Get Info** from **Action** (see Figure 3). This brings up the **Target Info** window. Again, make sure you are working with the **Release** configuration for the **Target**.

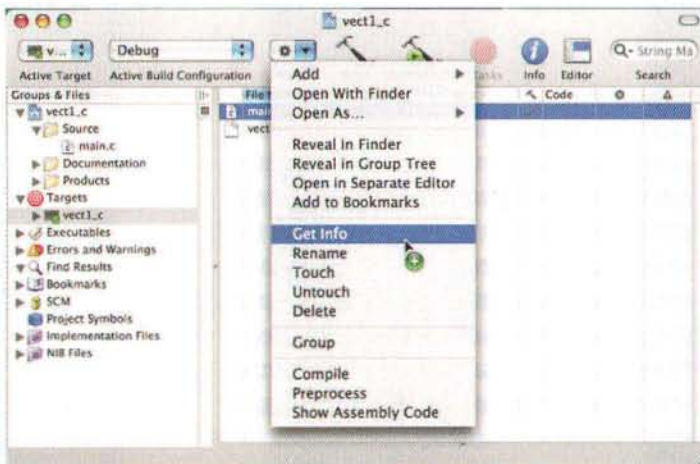


Figure 3: Bring up Target Info

For the **Collection** pull-down, you have two choices. You can view all compiler settings by selecting the Intel® C++ (or Fortran) Compiler 9.1 collection (Figure 4). This gives you access to the entire set of compiler options for the Intel C++ or Fortran compiler. Or as another choice, you can select the **General** collection which is under the Intel C++ or Fortran compiler collection (Figure 5). This collection also has the **Optimization** settings.

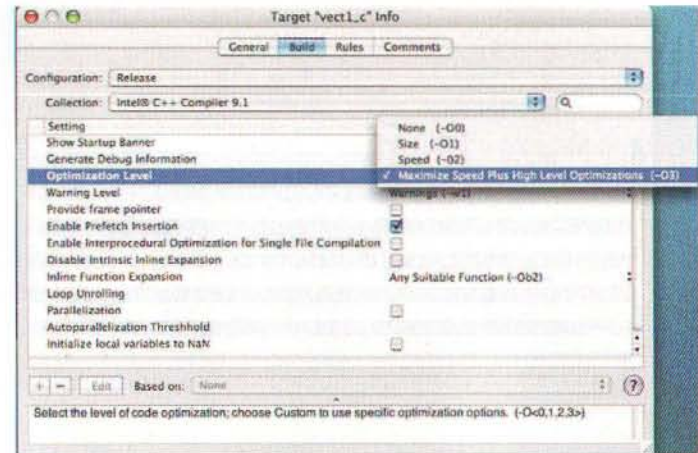


Figure 4: All settings from the compiler collection

Choose any optimization other than **None (-O0)** and vectorization will be performed by the compiler. For the command line, simply use the compiler options -O1, -O2, or -O3 and you are now taking advantage of the SSE features of the Intel Core Duo processor. Or are you? The next logical question is "how do I know that the compiler vectorized my code?"

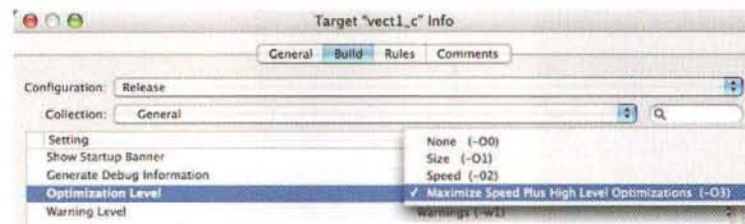


Figure 5: Optimization settings under General Collection

This brings us to examine how we determine whether or not the compiler is vectorizing individual loops. The Intel compilers provide a vectorization report option that provides two kinds of information: First, the vectorization report will inform you which loops within your code are being vectorized. The end result of a vectorized loop is an instruction stream for that loop that contains SSE instructions. This is essential information to verify that the compiler is indeed vectorizing the loops within the code that you expect it to vectorize. Secondly and what we find critically important, is report information about why the compiler did NOT vectorize a loop and why it did not vectorize a loop. This information assists a programmer by highlighting the barriers that the compiler finds to vectorization.

With the Intel compilers, one must enable the vectorization reporting mechanism. It is not enabled by default. Within the Xcode environment, the vectorization report is enabled by selecting one of the vector reports in the setting **Vectorizer Diagnostic Report** from the **Diagnostics** collection for the **Target** (Figure 6). The vectorization report is viewed in the **Build Results** window. The report follows the compilation for each source file, as shown in Figure 7

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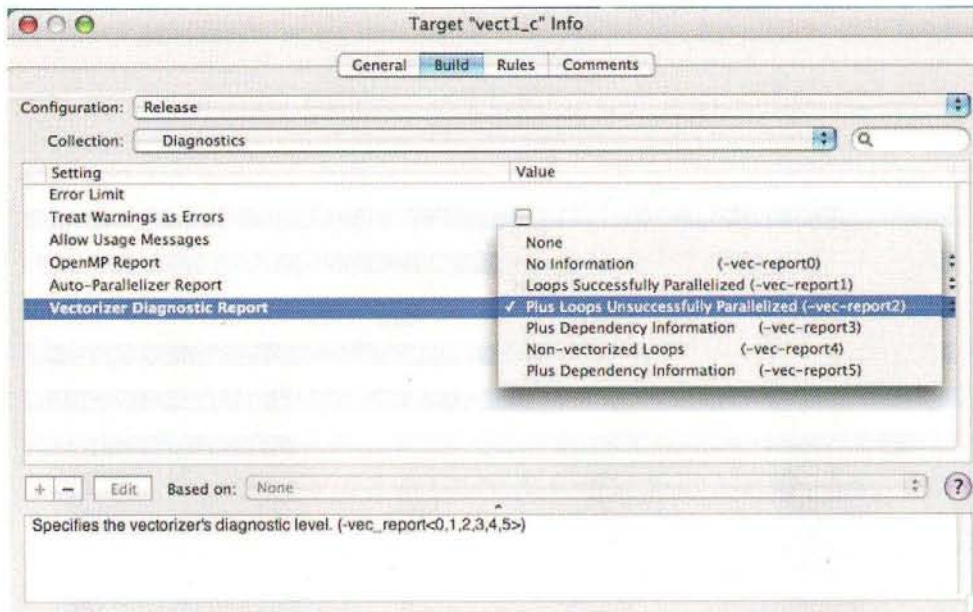


Figure 6: Enabling the vectorization report

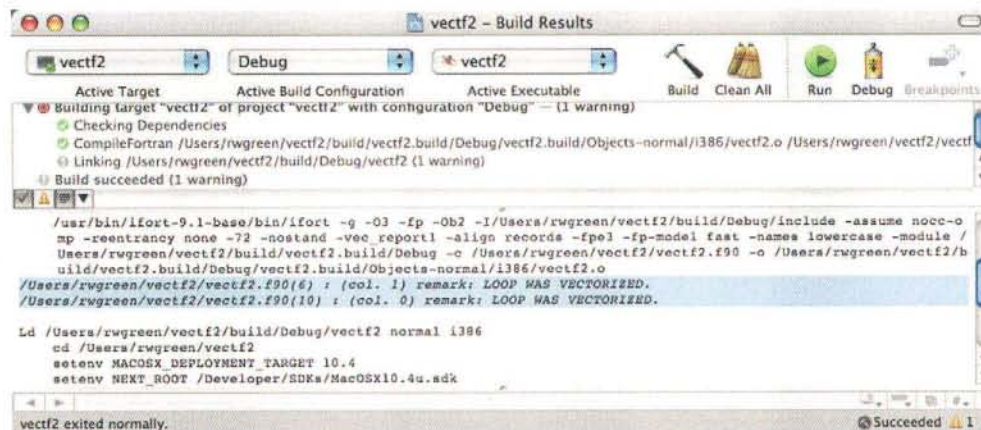


Figure 7: Vectorization report

The vectorization report option, `-vec-report=<n>`, uses the argument `<n>` to specify the information presented; from no information at `-vec-report=0` to very verbose information at `-vec-report=5`. The arguments to `-vec-report` are:

- `n=0`: No diagnostic information
- `n=1`: (Default) Loops successfully vectorized
- `n=2`: Loops not vectorized – and the reason why not
- `n=3`: Adds dependency Information
- `n=4`: Reports only non-vectorized loops
- `n=5`: Reports only non-vectorized loops and adds dependency info

Inhibitors to vectorization

The Intel compilers attempt to vectorize loops within the code. However, not all loops can be vectorized. There are too many cases to list in the space of this article. We will examine a few common scenarios where the compiler cannot vectorize a loop.

Outer Loops: When there are nested loops, the vectorization is applied to the innermost loop. Outer loops are never vectorized, so you can expect `-vec-report` to identify these cases. This can be seen by the output of `vec-report=3` in the example below:

```
$ ifort -O3 -vec-report=2 -o md md.f
...
md.f(212) : (col. 7) remark: loop was
not vectorized: not inner loop.
md.f(213) : (col. 9) remark: LOOP WAS
VECTORIZED.
...
212      do i = 1,np
213          do j = 1,nd
214              pos(j,i) = pos(j,i)
+ vel(j,i)*dt + 0.5*dt*dt*a(j,i)
215              vel(j,i) = vel(j,i)
+ 0.5*dt*(f(j,i)*rmass + a(j,i))
216              a(j,i) =
f(j,i)*rmass
217          enddo
218      enddo
```

In this abbreviated example from a molecular dynamics code, we see from the vectorization report that only the inner loop, the `do j=1,nd` loop, is attempted to be vectorized.

Data Dependencies: In order to be candidates for vectorization, a loop cannot contain **dependencies** between loop iterations. Dependencies occur when a strict ordering of the iterations must be enforced. Consider the following loop:

```
void scale(float* z) {
    float A; int i;
    A = 42.0;
    for ( i=0; i<10000; i++ )
        z[i] = A * z[i-1]; }
```

Which when compiled gives:

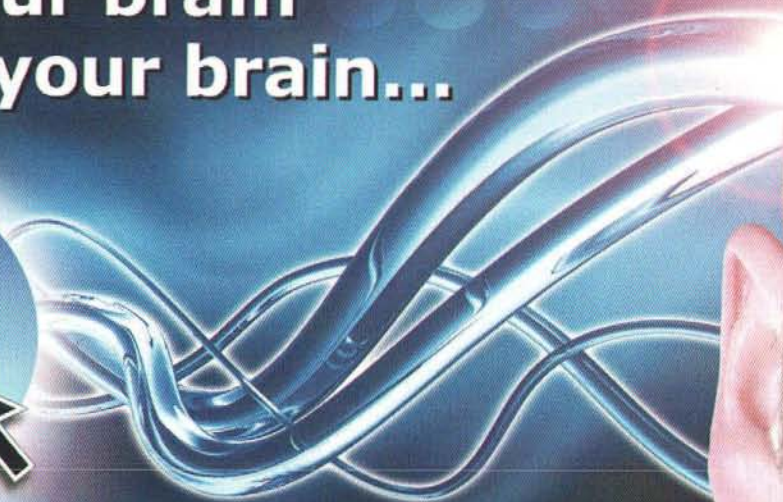
```
$ icc -O3 -vec-report=2 -c depend.c
depend.c(4) : (col. 2) remark: loop was not vectorized:
existence of vector dependence.
```

Examining this, we see that in order to calculate the value to store in `z[i]` we need to have already calculated the value for `z[i-1]`. This forces a strict, sequential ordering to when the calculations must be performed. There are many other interesting cases to consider in dependency analysis and the reader is encouraged to pursue this further by researching some of the references at the end of this article.

Function and Procedure calls: Another major inhibitor to vectorization is when the loop contains a function or procedure call. Consider this example:

```
1 c    Pi: Compute pi
2 c
3 c    Illustrates how to calculate the definite
integral
```


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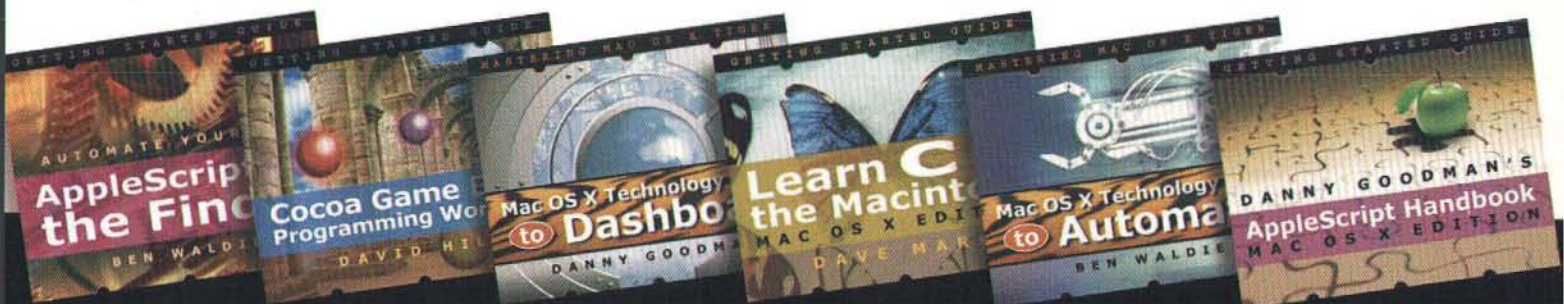


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```

4 c of a function f(x).
5 c
6 c We integrate the function:
7 c   f(x) = 4/(1+x**2)
8 c between the limits x=0 and x=1.
9 c
10 c The result should approximate the value of pi.
11 c The method is the n-point rectangle quadrature
rule.
12     program computepi
13     integer      n, i
14     double precision sum, pi, x, h, f
15     external     f
16     n = 1000000000
17     h = 1.0/n
18     sum = 0.0
19     do 10 i = 1,n
20         x = h*(i-0.5)
21         sum = sum + f(x)
22 10    continue
23     pi = h*sum
24     print *, 'pi is approximately : ', pi
25     end

```

Within the do loop above, a function call to f(x) is made. In this example, the function f is in a separate source file. The code for f is as follow:

```

c fx.f: Integration function
double precision function f(x)
double precision x
f = 4/(1+x*x)
end

```

When we attempt to compile these two source file with -vec-report, we get the following:

```

$ ifort -O3 -vec-report=2 -o pi pi.f fx.f
Pi.f(19) : ( col 12 ) remark: loop was not vectorized:
contains unvectorizable statement at line 21

```

Looking at pi.f we see at line 19 there is a loop that is a candidate for vectorization. At line 21 we see the statement `sum = sum + f(x)`. It is the call to the external function f(x) that is the issue. The external function may or may not contain data dependencies, thus the compiler makes the safe decision to not vectorize the loop

When one sees function or procedure calls within loops as in this example, the next logical step is to attempt to inline the function call. Inlining the function will allow the compiler to complete its dependency analysis and often times allow vectorization of the loop. With the Intel compilers, options -ip and -ipo perform interprocedural optimizations. One of these optimization is function inlining. -ip is used to inline functions or procedures and perform optimizations that are contained within the same source file. -ipo is an advanced feature of the Intel compilers. With this option, the compilers are able to find inlining and optimization opportunities across source files, as in this example. In this case, fx.f is a separate file containing the function f(x). Compiling with -ipo gives:

```

$ ifort -O3 -ipo -vec-report=2 -o pi pi.f fx.f
IPO: performing multi-file optimizations
IPO: generating object file /tmp/ipo_ifort0FmkdQ.o
pi.f(19) : (col. 12) remark: LOOP WAS VECTORIZED.

```

The runtime of the non-vectorized program took 40 seconds on an iMac with a 1.83Ghz Intel Core Duo processor. The vectorized version took 17 seconds. We need to point out that this was a very trivial case. Deeply nested and complex procedure call trees that are called from within a loop will almost certainly never be able to be inlined.



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Ill-defined loops: Compilers must be able to identify a loop and be able to determine the number of iterations, or trip count. Here are some example in C and Fortran:

```
int count = 1;
while (count <= 100){
    z[i] = x[i+1];
    count += 1;
}

I = 0
100 CONTINUE
Z(I) = X(I+1)
I = I + 1
IF ( I .LT. 100 ) GOTO 100
```

Branching outside of the loop: whenever there is a conditional branch inside the loop this can disqualify the loop as a candidate for vectorization:

```
for ( int i=0; i<100 ; i++ ) {
    z[i] = x[i+1];
    if ( z[i] == 0 ) exit(-1);
}
```

Techniques to Improve Vectorization

We've already seen several techniques that improve vectorization. These include writing clearly defined loops that are easy for the compiler to recognize. Since vectorization is performed on inner loops, it is especially critical for these inner loops. Although it's counter to module programming techniques, for efficiency it is best to avoid deeply nested procedure calls inside of computational loops. Try to keep procedure calls to one level of nesting if at all possible. And although we did not mention this earlier, it is much easier for compilers to recognize inlining opportunities when functions and procedures are within the same source file. However, as we've seen, if you must have the functions in separate source files make sure you use the interprocedural optimization compiler switch, `-ipo`, provided by the Intel® Fortran Compiler and Intel® C++ Compiler for Mac OS.

Finally, instead of writing your own version of mathematical functions, where available use vectorized versions of libraries. As an example, the Intel Compilers for Mac OS ship with a short vector math library, `libsvml`. This library has vectorized versions of common math functions normally found in `libm`. The functions in `libsvml` include the common transcendental functions `sin/cos/tan`, `asin/acos/atan` as well as `exp/pow`, and `ln/log10`. In addition, the Intel compilers provide optimized `memcpy`, `memcmp` functions which are also quite prevalent throughout any application. When using the Intel Compilers, this vectorized library will link prior to `libm`. Thus you will automatically link in vectorized versions of these common functions. Just remember to use the Intel drivers (`icc/icpc/fort`) for compiling and linking and do NOT add `-lm` to the link arguments.

Finally, for more sophisticated mathematical, encryption, image processing and statistical functions, Intel provides two other library products. The Intel® Math Kernel Library (Intel® MKL) for Mac OS provides BLAS, FFT, and vectorized statistical

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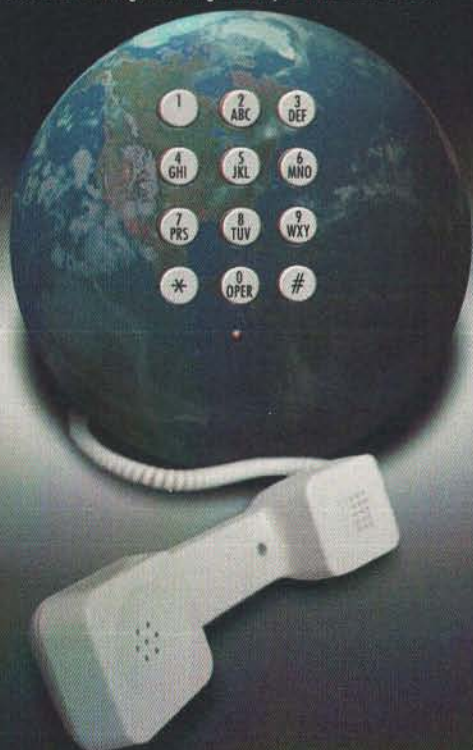
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libraries. These library functions are highly tuned and optimized to take maximum advantage the Digital Media Extensions of the Intel Core Duo processor. In addition to using SSE, these libraries are also multi-threaded to take advantage of both cores in the Intel Core Duo processor. Customers performing data compression, encryption, video encoding/decoding and speech processing will want to consider the Intel® Integrated Performance Primitives (Intel® IPP). Intel IPP routines are also highly tuned to utilize SSE.

Summary

The Streaming SIMD Extensions (SSE) architectural features of the Intel Core Duo processor enable integer and floating point acceleration for applications. SSE is a hybrid of traditional SIMD and vector processing methodologies. The Intel Fortran Compiler and Intel C++ Compiler refer to these techniques as **vectorization**. With the Intel Fortran Compiler and Intel C++ Compiler for Mac® OS, vectorization is enabled by default at optimization level 1 (-O1) and above. The Intel compilers also feature vectorization reporting via the `-vec-report` compiler option. Not only will the report list the location of loops vectorized, it will also list the locations of loops that were not vectorized and explain why it did not vectorize those loops. These hints enable the programmer to identify vectorization inhibitors which can often be removed, leading to substantial performance improvements.

Further Reading

A good place to start learning about SSE and advanced optimizations is in the Optimizing Applications chapter of the Intel C++ Compiler or Intel Fortran Compiler documentation which comes with the Intel Compilers for Mac OS. The SSE features of the Intel Core Duo processor are rich and extensive. So much so that a full treatment on this topic requires an entire book. The definitive guide to software vectorization and SSE is *The Software Vectorization Handbook*, Aart J.C. Bik, Intel Press, ISBN 0-9743649-2-4. If you are a programmer moving code from older Apple machines, using AltiVec instructions, there are some excellent resources covering AltiVec to SSE migration to be found on Apple's developer website (ADC).

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About The Author

Both authors are members of the Intel Compiler team. Ganesh Rao has been with Intel for over nine years and currently helps optimize applications to take advantage of the latest Intel® processors using the Intel® compilers.

Ron Wayne Green has been involved in Fortran and high-performance computing applications development and support for over twenty years and contributes to Fortran and technical computing issues.

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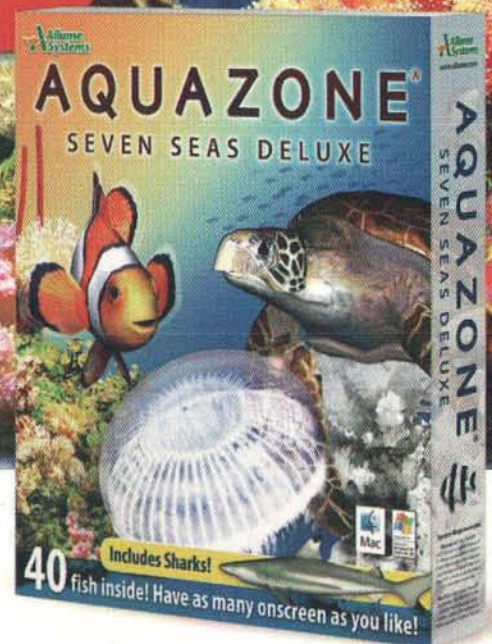


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Do You Copy?

Are you copying all the information about your files that you need?

By Dan Shoop

Introduction

The Macintosh environment has always been feature rich, and that extends to its files, file attributes, and file metadata the file system maintains for them. OS X has introduced Macintosh to a wider array of application environments which, aside from that of Classic, include beasts such as Carbon, Cocoa, BSD, X-Windows, Web Objects, Java, QuickTime, and now Rosetta. Additionally, OS X supports different file systems that support different metadata. All of these may see and consider files differently than others. This results in files being copied rather differently.

This article is a short attempt to attune application developers, scripters, systems programmers, and file system architects to considerations relating to file metadata stored by the file systems on Mac OS X.

Philosophic Questions

In many respects it is a philosophic question as to what each environment on the Mac should properly copy. Some environments may not normally or naturally have access to all file metadata that OS X maintains for any given file. Named Extended Attributes may not be accessible through Carbon, Cocoa and Core Foundations, while they may be accessible from BSD. The nature of the operation may color and determine what metadata is important and what makes sense for preserving as a copy or whether the metadata should be reflective of a whole new file.

Consider the subtle differences of what metadata, or even files, get maintained as part of the different functions of operations like copies vs archives vs backups vs clones vs sync vs snapshots, et cetera. Is a copied file a new file or is the copy merely a replica or clone? This isn't as easy of a question as it first seems. For instance, if you copy a file from one location to another, does it make sense to maintain any ACLs it may have had or shouldn't the new file have its own, new ACL? But now, what if that "copy" was a backup or clone and part of a larger set of files in its directory? Wouldn't you then expect the ACLs to be maintained? Likewise, if you're backing up a set of files would you expect metadata associated with the directory (like sort order, icon positions, etc) to be maintained for the files? Yet, these are stored in

places like .DS_Store or the Desktop Database, not as metadata for the file itself.

What about when we copy files to non-HFS+ file systems? What should be maintained? What should be expected if a file is copied off, then gets copied back? The Macintosh has defined the Apple Double format to store a file non-natively. Is it right for a Windows sysadmin to delete .file's or .DS_Store's found on their file systems; is this "clutter"? To the Mac user who's lost the CODE resource of an application file, icons or font resources, a file's creation date, or creator/type you may end up with torches and pitchforks at your door if you're inconsiderate, and confusing if your tools are inconsistent. But should an ACL get copied to a foreign file system? Maybe not, but other Extended Attributes clearly are in Apple Doubles.

Moreover, consider what file creation, copying, and modification may mean. For instance consider that `cat > file` is often seen as creating a new file, but that if 'file' already existed then this operation is in fact a "modification".

Lastly, in the future we may be limited as to what we may and may not copy through DRM. This may become a technical rather than semantic issue as "secure" file systems and files are deployed (as in secure for the owners of the content).

Mac OS X File Metadata and Attributes

Briefly, let's run down some of the most significant file metadata and attributes common to Mac OS X.

Data Streams

The data fork is well known, but all Macintosh files have at least two forks, a data fork and a resource fork, either of which may be of zero length. Implied is that both exist. Under HFS+ multiple named streams may exist, which may be named, but the data and resource streams may not be renamed. Until Tiger, this was merely semantics.

Traditional views of files are just a single byte stream of named data (like found on a tape) with beginning-of-file

(BOFs) and end-of-file (EOFs), and little to no metadata. The metadata was just "accounting" information used by the file system, it wasn't really "the data". However, over the years additional information was tacked on by file systems. Users got used to this additional metadata for cataloging and sysadmins got used to preserving them on backups. Environments became more complex and file systems started offering better ways to store ancillary data. The Macintosh isn't unique in offering multiple streams per file. Even Windows' NTFS has such provisions. HFS+ defined an architecture for "unlimited" numbers of streams or forks using the Attributes B-tree structure on the volume.

Under OS X the mandatory data and resource forks of a Macintosh file are exposed on HFS+ volumes as filename and filename/..namedfork/rsr to BSD environments and as filename and ._filename when "split" (as for use on foreign file systems.) It also introduced tools for splitting and recombining forks split into what are arguably Apple Doubles.

Mac OS X 10.4 Tiger introduced the concept of Extended Attributes which implemented and exposed the additional named forks or streams on HFS+ volumes and through the 'split' fork ._filename on foreign file systems. ACLs are in turn implemented as a privately named and protected Extended Attribute and hence are a third fork that files may have on file systems that have ACLs enabled. Additionally any number of additional "Extended Attributes" (forks) may now be added to or read from a file with `setxattr()`, `getxattr()`, `listxattr()`, and `removexattr()`.

Finder Flags

See `man GetFileInfo` for details, but these include file creator and type, attributes bits (such as locked, stationary, invisible), creation date and modification date. Stored in the ._filename Apple Double half on file systems other than HFS and its derivatives.

POSIX

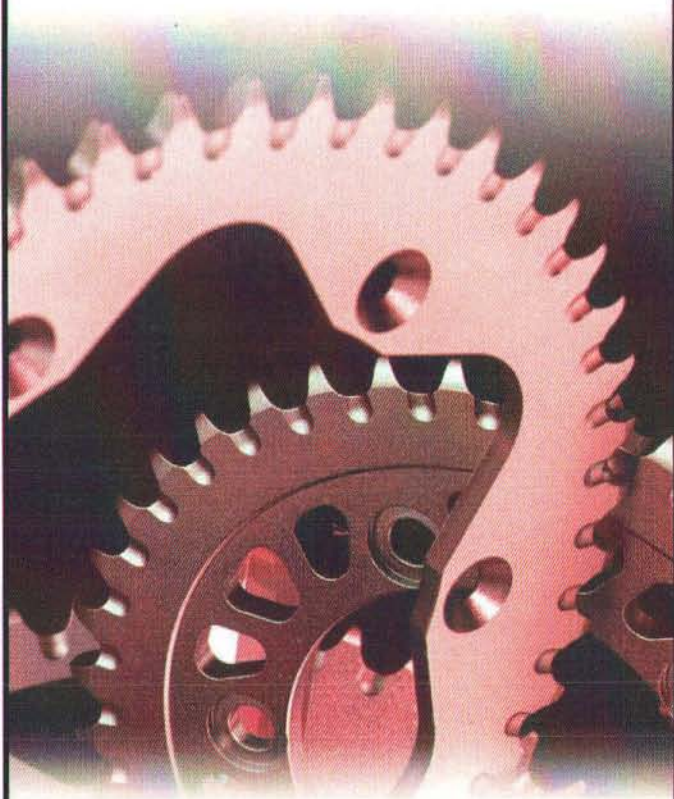
Files have ownerships (user and group) and permissions. Symbolic links also have these attributes. Unix files also traditionally carry dates such as `atime`, `mtime`, and `ctime`, namely, the time of last access, last time file modified, and change time (last time the file's inode was changed), respectively. Note that `ctime` changes after operations like `chmod`.

Creation Dates

The subject of creation dates on the Mac warrants detailed discussion in itself. The Mac has always maintained file "creation date" metadata, it's a Finder file attribute, copied along with the file by the finder, displayed in the Finder's Get Info dialog and important enough that it is supposed to be included as part of the Apple Double file information stored in a ._file. But, while Mac users are long familiar with it and often use it to categorize files it's a rather foreign concept to unix (mostly because it traditionally never existed there), and some unix pundits believe it's just woolly-thinking (see <http://mail-index.netbsd.org/netbsd-users/2000/11/22/0000.html>) or at best the product of the confused (see <http://toadstool.se/journal/2006/01/11/the-fallacy-of-ctime>). Other

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unices and file systems support a btime (birth time) with varying degrees of success.

However, Mac users are used to creation dates, and may get rather agitated if they're lost or, say replaced with the modification time (which seems to be the OS X BSD environment behavior). As such, applications should strongly consider properly handling this metadata or, if they do mangle it, do so in a manner that lends itself to notice (like beginning of epoch).

For a more detailed commentary of Mac file creation dates see <http://blog.plasticsfuture.org/2006/06/27/mac-os-file-creation-dates/>

BSD Flags

BSD has traditionally maintained a series of flags associated with properties of a file as manipulated by ``chflags``. These include flags such as the 'system immutable flag' (`schg`) that prohibit a file from being modified, or the 'archive flag' (`arch`).

The classical Desktop Database and OS X .DS_Store files

Traditionally the Macintosh stored certain metadata regarding files in the Desktop Database. Under Mac OS X the .DS_Store file associated with a directory contains similar information such as directory background info, the position or order of files and their icons within a directory, and more. When copying a directory you should probably consider copying these.

Lastly there's one Finder-level piece of information stored, disassociated from the file, which brings us to...

Spotlight Metadata

Tiger introduced us to Spotlight and a huge amount of application specific metadata stored that is associated with a file based on its content. This data is indexed by the kernel through 'importers' as a part of normal operations on the file.

While most of this doesn't need to be preserved since it is indexed as needed by the kernel, one attribute exposed to the Finder and stored in .DS_Store is what traditionally was known as the file Comments, called under Tiger the Spotlight Comments, and is displayed through the Finder's Get Info dialog.

How to preserve file metadata

There a few primary methods by which file metadata get preserved:

- copied natively
- preserved in special containers or lists
- preserved by images of the volumes that support them (e.g. .dmg's)
- split as Apple Doubles

BSD copies files using `copyfile()` which splits to Apple Doubles as necessary either internally or externally (with varying results)

Note that, currently, `copyfile()` munges the modified date into the creation date field of its Apple Doubles.

What needs to be copied? What doesn't?

While mostly a philosophic issue, it's probably safe to say that traditional Macintosh attributes such as creator and type are becoming less important since OS X has various mechanisms for associating files with their applications (sometimes at the cost of additional metadata) while other metadata, like creation date, should arguably be maintained. Spotlight metadata looks like a good candidate for general exclusion since the kernel will automagically recreate this for installed application importers on the target machine, but all Mac OS X systems might not have the same importers installed. This may or may not matter. Old Desktop Database files probably aren't an issue either as Classic withers or is mooted by Intel Macs, but .DS_Stores should probably be maintained if you're backing up a volume. Mandatory file forks should always be copied, but while these are Extended Attributes you might consider not copying the other forks that may exist, such as ACLs, depending on if you're backing up or cloning, or, if you're just duplicating the file elsewhere on a volume. It's hard to tell currently if other Extended Attributes need copying since they're rarely seen in action.

What Copies What?

Let's take a look at what metadata, some common tools and their operations preserve. The following is not designed to be a "report card" and it's not my goal to rank or rate a tool for its handling of the data, but sysadmins should be aware of how operations they perform may affect their data.

Coverage of various third-party backup applications is beyond the scope of this article, but it seems they fare rather poorly with regard to not preserving Extended Attributes aside from resource forks. Creation dates are a mixed bag and may vary within the application based on operation (sometimes intentionally). For additional discussion, see <http://blog.plasticsfutures.org/2006/03/05/the-state-of-backup-and-cloning-tools-under-mac-os-x/>

In general, `copyfile()`, which most all BSD tools rely on, does not perform consistently compared to the operation of the Finder. Creation date is clobbered by the modification date despite that `copyfile()` attempts to use Apple Doubles 'internally' and externally to foreign file systems and the Apple Double format specifically calls for the creation date. The various tools that use `copyfile()` then quite often fail to properly maintain internal or synthetic files resulting in lost Extended Attributes and other data. In rare cases the tool may crash, as in the instance of trying to ``rsync -aE`` a file with both ACLs and an additional non-resource fork, named Extended Attributes.

Apple System Restore (`asr`) in device mode manages to copy all the tested data, but this is to be expected since it is essentially a complete copy of the device. In file mode, however, `asr`, Disk Utility, and `hdiutil` have digressed in their behavior with OS X 10.4.6. Where previously it maintained locks (the Finder "L" attribute and BSD `uchg` flags), Extended Attributes and ACLs;

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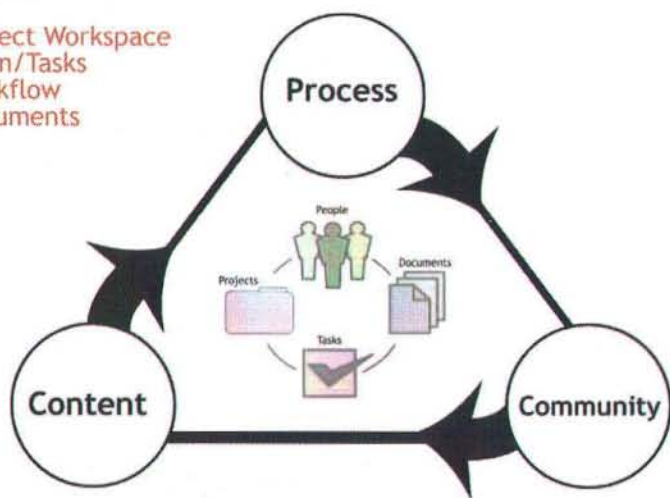
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it no longer preserves them, though this may change in a future update or (although this makes packages and dmgs problematic) it may be the intended behavior.

'dd' fares pretty much as you'd expect. At least philosophically it's understandable.



About The Author

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Editor's Note: To download a copy of the following table for reference please visit the MacTech source code ftp and select this month's issue, 22.08 :

<http://www.mactech.com/editorial/filearchives.html>

	Finder Flags			Dates		Extended Attributes			BSD Flags	POSIX			File ID (for aliases)	Finder Comments
	attribute bits	creator/type	locked	creation	modification	rsrvc fork	ACLs	xattr		owners	permissions	symlink owners		
Finder	X	X	X	X	X	X	8	X	3	0	X	0	0	X
cp -Rp	X	X	X	1	X	X	0	X	X	X	X	0	0	X
ditto	X	X	X	1	X	X	0	X	0	X	X	0	0	X
rsync -aE	0	0	0	1	X	0	2	0	0	X	X	X	0	X
tar	0	0	0	1	X	4	2	4	0	X	X	X	0	X
asr (device mode)	X	X	X	X	X	X	X	X	X	X	X	X	X	X
asr (file mode)	X	X	0	1	X	X	0	0	0	X	X	0	0	X
Disk Utility dmg	X	X	0	1	X	X	0	0	0	9	X	0	0	X
hdiutil dmg	X	X	0	1	X	X	0	0	0	9	X	0	0	X
dd (6)	7	7	7	7	7	7	7	7	7	7	7	N/A	N/A	5

NOTES:

Darwin Kernel Version 8.7.0: Fri May 26 15:20:53 PDT 2006;
root:xnu-792.6.76.obj~1/RELEASE_PPC

Finder Comments only copied if whole directory copied (that is, if you just copy the file, you must copy the .DS_Store)

X- Copied

0 - Not copied

1 - replaced w modification date

2 - xattr info munged, doesn't display "+" in ls but ls -le displays ACL,

attribute becomes non-private

3 - uch flags set from Finder locked ("L" attribute) preserved, others

BSD flags appear lost

4 - generates warning, can't stat file, not preserved

5 - even if we dd .DS_Store file

6 - dd ONLY copies data

7 - dd writes whole new files

8 - no longer displays "+" in ls -le but ls -le displays ACL

9 - requires "-owners on"



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Using a Mac OS X client with a Linux L2TP/IPSec VPN Server

I recently had the good fortune to work with a great Open Source VPN Server called Openswan, and took the opportunity to learn about connecting it with Mac OS X. Naturally I couldn't resist writing an article about my experience.

This article will discuss how you can use the built-in VPN client of Mac OS X v.10.3 (Panther) or v.10.4 (Tiger) with a Linux Openswan VPN server. If you are looking for information about the Mac's L2TP/IPSec client, you can find some of that here as well.

In addition to L2TP/IPSec, Panther and Tiger also support plain IPSec (i.e., without L2TP). But for this feature you will have to edit text files manually or use one of the third party GUI clients. Plain IPSec makes configuration on the Linux server much easier. If you can use plain IPSec, you don't have to jump through all the hoops as described in this article. I refer you to the Openswan Wiki for more information on plain IPSec interoperability between Openswan and Mac OS X.

Apple's L2TP/IPSec implementation supports multiple authentication mechanisms. For "Machine authentication" (the IPSec part of the L2TP/IPSec protocol) there are basically two methods: Preshared Keys (PSKs) and X.509 machine certificates. Tiger's GUI supports both of these methods but Panther's GUI only supports PSKs. PSKs are easier to configure than certificates but certificates provide better security and in some cases certificates are required for supporting Road Warriors. So, Panther not supporting certificates for L2TP/IPSec is a pretty severe limitation. Once the IPSec authentication succeeds, the next step is "User authentication" (the L2TP/PPP part of the protocol). Tiger supports CHAP passwords, RSA SecurID hardware tokens, user certificates and Kerberos. Panther supports CHAP passwords and user certificates (but these user certificates cannot be used for IPSec authentication; you will need machine certificates for that).

Another limitation is that Panther and Tiger currently do not interoperate well with most other IPSec implementations when NAT is involved. A workaround for this problem has been added to Openswan 2.4.2 but there are some issues with it. There are reports that as of Tiger (10.4.4) actually fixes this.

In a nutshell: there is some L2TP/IPSec support in Mac OS X but there is certainly room for improvement.

Background Information

Mac OS X 10.3 and 10.4 ship with an L2TP/IPSec client. The Mac's IPSec implementation is based on KAME which is known to interoperate with Openswan. I've also found the possibility of a working setup that connects Mac OS X's VPN client with a native IPSec implementation of the Linux kernel 2.6, plus `l2tpd` and `ipsec-tools` (racoon).

L2TP Discussion

The big question of course is: why would you want to use L2TP with the Mac? L2TP/IPSec has the advantage that it is an official IETF standard. Furthermore, IPSec is generally considered to be more secure than PPTP. As Apple writes, *"L2TP is Mac OS X Server's preferred VPN protocol due to its superior transport encryption and its ability to be authenticated via Kerberos."* These are indeed valid points: a Mac client and an Openswan server can in principle agree upon the use of strong encryption (AES, SHA-1, etc.). I have not used Kerberos on the Mac, so I cannot comment on that.

Connecting with PSK (Panther and Tiger)

The GUI in both Panther and Tiger supports PSKs. I've provided step-by-step instructions for this procedure:

1. Open the Application folder.
2. Open "Internet Connect".
3. If you see a padlock with the text "VPN (L2TP)", continue with Step 4. If you do not see the padlock, you will have to add it: open the menu, choose "File" and then "New VPN Connection". You will be asked to choose between "L2TP over IPSec" and "PPTP". Select "L2TP over IPSec".
4. Click on the padlock with the text "VPN (L2TP)".
5. In the "Configuration" pull-down menu, select "Edit configurations...".
6. Enter the authentication details for your VPN connection: the IP address of your Linux server, the "Account Name" (=CHAP username), "Use Password" (enter CHAP password). Do not use RSA SecurID, it is not supported by Openswan.
7. Enter "Shared secret". This is the IPSec PSK that you enter in `ipsec.secrets` on your Openswan server.

8. Save settings.
9. Click "Connect".
10. The L2TP/IPSec connect will be set up.

If everything is OK then "Status" should say: "Connected To", followed by the IP address of the PPP server on the internal interface.

Connecting with a Certificate (Tiger only)

Tiger's VPN client GUI supports both certificates and PSKs for IPsec authentication. Panther's GUI only supports PSKs. There are two steps involved: first you import your PKCS#12 user certificate and then you add a VPN configuration that uses this certificate.

I am not aware of documentation by Apple or a webpage which provides any information on how to import a client certificate for L2TP/IPsec authentication. So I had to come up with something myself. This procedure worked for me but may be too complex for some users. Note that I have not tried this procedure on Mac OS X versions below 10.4.3.

Passwords Overview

First some remarks on passwords. Passwords are used for several tasks on Mac OS X. At several stages you will be prompted to enter a password. It may not always be clear that kind of password will be required at a certain point in time. Here is a short overview of the different types of passwords in Mac OS X.

- Login password: this is the password that you use to login on the Mac. The password is set using the "Accounts"

application by a user with Administrator privileges.

- Certificate password: this is the password that protects the PKCS#12 file containing the machine certificate. You need the password to access the encrypted parts of the file.
- Keychain Access password: this is the password that you enter in the "Keychain Access" application to access the "System keychain".
- CHAP password: this is the "User Authentication Password" that you enter in the "Internet Connect" application. It is used in the L2TP/PPP phase of the L2TP/IPsec protocol.
- Preshared Key: this is also a kind of password but PSKs are not involved when you use certificates for authentication. I am just mentioning PSKs here for completeness.

Creating User and Server Certificates

Certificates will have to be created for the Openswan server and the L2TP/IPsec clients. I do not provide detailed information on generating certificates because it is outside the scope of this article. There is however one thing that is very important when Mac clients are connecting to your Openswan VPN server: **the server certificate must contain an ID which matches the hostname ("USER_FQDN") or IP address ("IPV4_ADDR") of the server.** This ID must match whatever you entered in the "Server Address" field in "Internet Connect". Obviously using a fixed IP address as the ID is not very flexible so in most cases you would want to use a

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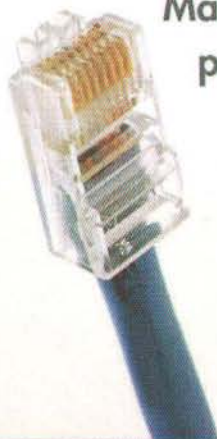
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hostname in the server certificate. Tiger clients will not accept a server certificate that uses a Distinguished Name ("DER_ASN1_DN") as its ID, such as "C=US, O=ACME, OU=Research, OU=Special Effects, CN=Bart Simpson". Note that certificates issued to clients are allowed to contain any type of ID. Unlike server certificates there are no restrictions for client certificates.

The exact procedure for adding a hostname or an IP address to a server certificate depends on the software that you use to generate the certificate. If you use OpenSSL, you will have to add one of the following options to the [user_cert] section in openssl.cnf before you generate the server certificate:

```
subjectAltName=DNS:vpnserver.example.com
```

or:

```
subjectAltName=IP:10.10.12.16
```

One of these two lines will have to be added. More information can be found in the Strongsec documentation (see References).

Modifying the Openswan Configuration

As mentioned above, the server's certificate contains an ID that is an IP address or a hostname. The Openswan configuration file ipsec.conf should match this and the "Server Address" field:

```
leftid=@vpnserver.example.com
```

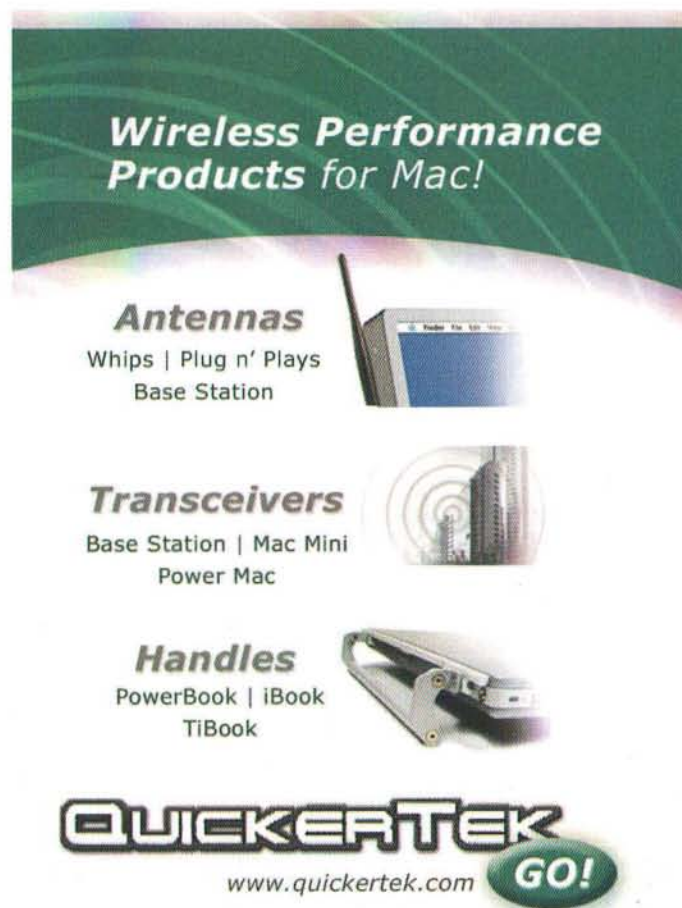
or:

```
leftid=123.123.123.123
```

Importing the User's PKCS#12 Machine Certificate

The following procedure allows you to import one or more PKCS#12 certificates for use with L2TP/IPSec on Tiger:

1. Logon to Tiger as a user with administrative privileges.
2. Open the Applications folder.
3. Open the Utilities folder.
4. Open the "Terminal" application
5. Type the following command (all on one line) and press Enter: `sudo "/Applications/Utilities/KeychainAccess.app/Contents/MacOS/Keychain Access"` (You will need to be using an administrator account to make use of sudo)
6. Enter your login password.
7. Click the button "Show keychains" (at the left-hand bottom). You should now see a number of keychains at the left-hand top: "login", "X509-roots", "X509-certificates" and "System".
8. Click on the "System" keychain. It will be highlighted.
9. From the menu, select File -> Import (or press Option-Shift-I).
10. Select the PKCS.12 file.
11. Enter the certificate password.
12. Enter the Keychain Access password.
13. Typically, three items will be added to the System keychain in this stage: a private key (grey key symbol), a root certificate (orange symbol) and a machine certificate (blue symbol). If you examine the details ('summary') of the machine certificate or the root certificate, you will notice that they are reported as 'untrusted'.
14. Drag the root certificate from the "System" keychain to the "X509Anchors" keychain. This will change the status of the certificates from untrusted to trusted. (Unfortunately the status is not immediately updated but if you quit Keychain Access application and start it again, you will notice that indeed they are now trusted).
15. Exit the Key Access application.



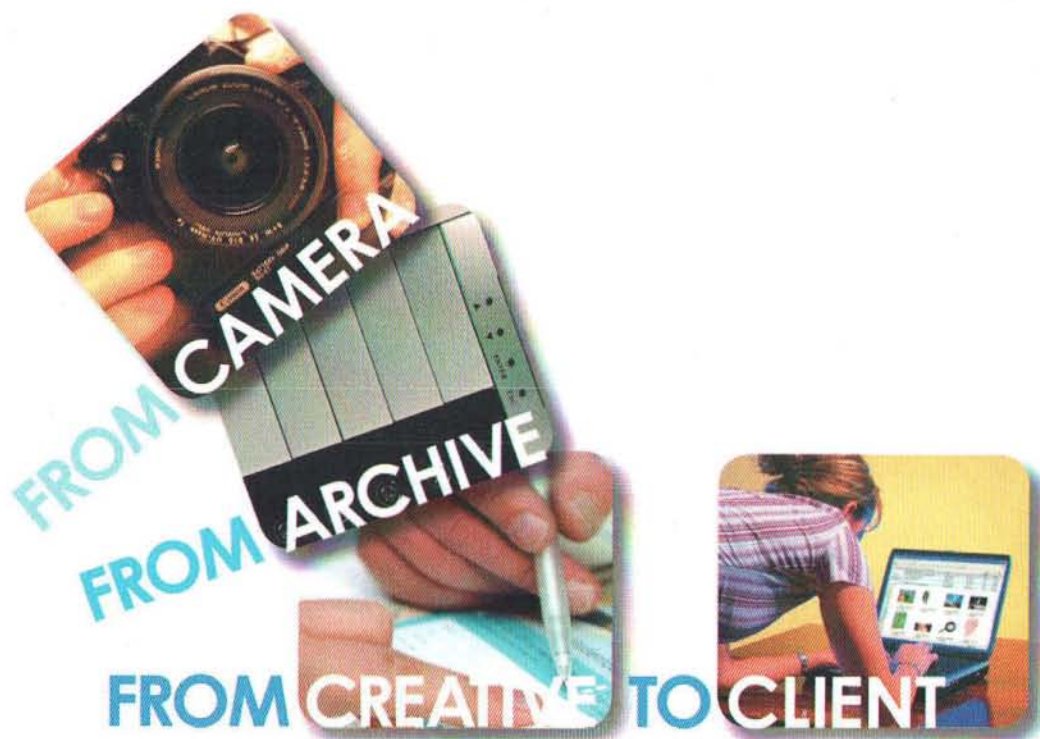
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If you did not see any items in the "System" keychain, then click "All Items" in "Category". It works as a filter so perhaps the certificate was actually imported but simply not shown because of the filter.

If you get this error: "An error has occurred. Unable to import an item. CL_INVALID_FIELD_POINTER" then you have started the Keychain Access application as a normal user. That will work fine for importing user certificates (in the "login" keychain) but not for machine certificates. You will have to open a Terminal and enter the "sudo" command as mentioned above.

If you get this error: "An error has occurred. Unable to import an item. CSP_INVALID_DATA" then you typed an incorrect PKCS#12 password.

Unfortunately there is no indication about which private key to which certificate. So should you want to delete a certificate by very careful about which corresponding private key you delete. Strangely enough you don't need administrator privileges to delete certificates and private keys from the "System" keychain. You only have to enter your Keychain Access password.

Alternative Method of Importing the Machine Certificate

If you are a die-hard command line fan you can use the utility 'certtool' that is included with Mac OS X. I did not look into this much because 1) it is less user friendly than the procedure described above and 2) I have done only cursory testing of this procedure. Anyway, here are the commands for importing a file named 'yourcert.pl2' in PKCS#12 format:

```
openssl pkcs12 -in yourcert.pl2 -cacerts -out ca.pem -nokeys
openssl pkcs12 -in yourcert.pl2 -clcerts -out client.pem -nokeys
openssl pkcs12 -in yourcert.pl2 -nocerts -out key.pem -nodes
cp /System/Library/Keychains/X509Anchors
$HOME/Library/Keychains/X509Anchors.bkp
cp /Library/Keychains/System.keychain
$HOME/Library/Keychains/System.keychain.bkp
certtool i ca.pem k=X509anchors.bkp v
certtool i client.pem r=key.pem f=1
k=System.keychain.bkp v
sudo cp $HOME/Library/Keychains/X509Anchors.bkp
/System/Library/Keychains/X509Anchors
sudo cp $HOME/Library/Keychains/System.keychain.bkp
/Library/Keychains/System.keychain
rm ca.pem client.pem key.pem
```

You will be asked three times for the certificate password. After that, you will be asked for the Keychain Access password and then for your login password.

A special thanks to the author of this Mac OS X hint.

Adding a VPN Configuration with Certificate Authentication

The GUI is not the only way to configure IPSec on Mac OS X. If you are familiar with KAME you could edit KAME's configuration files manually. I have not tried this because this

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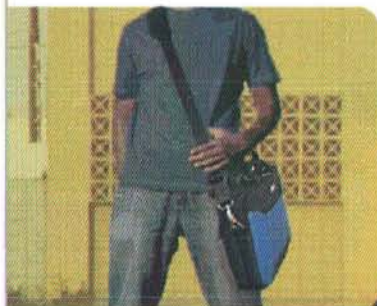


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is probably too much to ask for the typical Mac user. Advanced users who are able to configure KAME from the command line probably do not need the GUI and the L2TP protocol anyway. Wolfgang Hennerbichler has done this for a project. He writes:

"OS X creates config-files on the fly, but the main racoon.conf is not touched, instead there's a line in racoon.conf that says: include "/etc/racoon/remote/.conf" So I changed the racoon.conf just to my needs (certificates and so on), and removed this include line. With that, you can set the connection up via the GUI, and racoon will be called by the GUI with the correct parameters and the policies will be set correctly. This might be a problem if you have more than 1 network (different certificates) to connect to."*

The relevant configuration file can be found on Hennerbichler's website (see References). "Agent Smith" provided a similar setup on the Openswan mailing list.

NAT Traversal

Apple has implemented the IETF NAT-T standard (RFC 3947) in Mac OS X Panther (10.3.6+) and Tiger (10.4.0-10.4.3). Unfortunately, Apple decided to deviate from the NAT-T standard in a small but subtle way so that it is not compatible with most other IPsec implementations. Supposedly, Tiger 10.4.4 and higher contain the proper support for RFC 3947 which would mean that you can also use it to connect to less recent versions of Openswan). Mac OS X sends the non-standard vendor ID string "draft-ietf-ipsec-nat-t-ike" instead of "RFC 3947". Additionally, according to some reports Apple actually implemented draft version 8 of the NAT-T standard which was the latest draft before the standard was ratified. This draft version is not the final version and, in fact, draft 8 jumped the gun a bit because it uses invalid ISAKMP payload types which were already allocated to RFC 3547 by IANA. This means that this stage the NAT-T support in Mac OS X will probably not interoperate with other IPsec implementations unless they specifically support this Mac OS X quirk. Apple's Mac OS X Server is one of these implementations; the Stingerhorn L2TP/IPsec Gateway is another. Apple's racoon modifications are available on their website, but they are available under the Apple Public Source License which unfortunately means that you cannot use these modifications directly in Openswan (=GPL) or KAME (=BSD). Apple does not want to re-license the code either because of legal concerns.

Peter Van der Beken has created a patch for Openswan that supports Apple's oddball NAT-T version. This patch has been adopted by Michael Richardson of the Openswan team and incorporated in Openswan 2.4.5+. Paul Wouters of the Openswan team noted that a rekeying problem occurred after one hour. Note that even with Openswan 2.4.5+ you will still not be able to use NAT-T with a PSK if your

Openswan server is using KLIPS. This is because the NAT-T patch for KLIPS does not support PSKs. You will have to switch to NETKEY because NETKEY does support NAT-T with PSK authentication. Also note that NETKEY has problems supporting the Mac's floating UDP source port. I have also not tried to connect with multiple Macs behind the same NAT device so I do not know if that is supported.

I hope that one day Apple will see the light and release a Software Update for Mac OS X that conforms to the official NAT-T standard and/or drafts. Because Apple's racoon version is based on KAME's racoon which has been discontinued, there is a chance that Apple will be forced to switch to ipsec-tools' racoon which is still in development. This would be great news because ipsec-tools is originally a Linux port of racoon so interoperability with Openswan should be excellent. Other BSD versions such as NetBSD have already switched to ipsec-tools.

Perfect Forward Secrecy (PFS)

Perfect Forward Secrecy (PFS) provides extra security. When you enable PFS, you adversaries (hackers, competitors, law enforcement, the mob, etc.) cannot decipher packets sent through the IPsec connection, *even* if they can eavesdrop on the encrypted connection *and* they have your secret key (through hacking, court order, escrow, etc.). This property of PFS is also known as *escrow-foilage*.

In the ipsec.conf file, there is a line:

```
pfs=no
```

This line is required because Mac OS X L2TP/IPsec client do not enable PFS. Openswan, on the other hand, enables PFS by default. One could only speculate why PFS is not used by Apple as a default. Is it because of the *<insert your favorite 3-letter government agency>*?

Mac OS X does not propose PFS by default. I don't know how to enable PFS through the Mac OS X GUI (e.g., the "Internet Connect" program). There is no mention of a "PFS" setting. I suppose the default racoon.conf can be modified so that PFS is enabled but I haven't tried that.

AES, SHA-1, DPD, and ICOMP

By default, Mac OS X will propose ISAKMP SAs and 3DES encryption, HMAC authentication based on SHA-1 hashes and DH group 2 (MODP1024). These are reasonable defaults and Openswan will accept them.

Mac OS X will also propose IPsec SAs with either 128-bit AES or 168-bit 3DES encryption and HMAC authentication based on SHA-1. These are used for the bulk encryption so they affect the throughput of the L2TP/IPsec connection. Older versions of Openswan will use 3DES and SHA-1 for IPsec SAs by default. These are good defaults for Windows clients that use the built-in IPsec stack. However, Mac clients also support AES, which is much faster than 3DES, so you might want to enable AES support in Openswan. For instance, by adding the following lines to the connection section(s) in your ipsec.conf:

```
ike=aes-sha,3des-sha  
esp=aes-sha1,3des-sha1
```



```
if (your_website_stats == ???) {  
    try_visistat = free;  
    setup = no_brainer;  
    web_stats = !!!;  
}  
else {  
    no_clue = true;  
}
```

```
//REAL-TIME WEBSITE TRACKING  
goto = www.visistat.com;
```



The Mac OS X configuration file `racoon.conf` contains a line that should enable the *deflate* type of IPSec compression (IPCOMP) for its IPSec SAs. But it seems that the Mac OS X kernel does not support it. I don't see an IPCOMP header in the packets that the Mac sends. Openswan supports IPCOMP deflate but by default it does not enable it. You can enable deflate compression by `compress=yes` to the connection section(s) in your `ipsec.conf`. But this will not result in actual use of IPCOMP because the Mac OS X kernel does not seem to support it.

Dead Peer Detection is not supported by Mac OS X's `racoon`. It is based off an old KAME version that lacks DPD support. More recent `racoon` versions (i.e. those in IPSec-Tools Package) do support DPD.

Troubleshooting

In case of problems, you can open the "Connection Log". You can find it in the menu under "Windows". For even more detail, you can examine `racoon`'s log file at `/private/var/log/system.log`.

Here is an example of a problem I ran into and how I used `system.log` to trace the cause. I had defined a connection on Mac OS X for a certain server. I had installed another server with the same configuration and I wanted to test it as well, so I simply changed the IP address in Internet Connect's main window. I did not change the username, password and shared secret. Since I had not changed them, I figured that the same settings would be used to connect to the second server. It turned out that this was not the case for the shared secret. When entered in the "Edit configuration..." window, the shared secret is specifically for the server whose IP address you entered there

(apparently the Keychain application stores shared secrets in such a way that they are bound to an IP address). I got the following error in `system.log`:

```
Nov 15 12:02:17 localhost racoon: ERROR:
oakley.c:2071:oakley_skeyid(): couldn't find the pskey
for 192.168.0.111.
```

I had to go to "Edit configurations..." window and change the IP address there. You cannot change the IP address in Internet Connect's main window and expect it to work.

VPN Alternatives for the Mac

The built-in VPN client is not the only VPN client for Mac OS X. There are others as well. None of them supports L2TP/IPSec, though. The following products are basically front-ends for the Mac OS X's built-in IPSec clients.

1. **IPsecuritas** from Lobotomo Software adds a graphical front-end to the built-in IPSec core, "allowing you to set up secure communications within minutes". It is freeware and known to interoperate with Openswan, KAME (`racoon`) and NETKEY. It contains a Certificate Manager (Actually, I believe it uses KeyChain for this). A how-to with screenshots for connecting with IPsecuritas to an Openswan server is available.

<http://www.lobotomo.com/products/IPSecuritas/>

2. **VaporSec**: Mac OS X v10.2+ contains IPSec support through KAME, but does not support L2TP/IPSec. VaporSec is a free user interface for KAME which is normally configured



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through ASCII configuration files. VaporSec creates IPSec policies that will allow you to connect to other IPSec devices. This may be another Mac OS X v10.2+ machine or a third-party firewall, VPN or other IPSec device. I think it has been tested with FreeS/WAN. I see no mention of compability with Mac OS X 10.3 Panther, but accord to Patrick Tschudin, it does work.

<http://www.afp548.com/Software/VaporSec/>

3. **VPN Tracker** from Equinux is a commercial IPSec client for Mac OS X. They make a couple of statements:

(a) *"Panther only supports a special protocol and not the standard IPSec".*

This is not quite true. Mac OS X's GUI only supports L2TP/IPSec, which is not a "special protocol" but an official IETF standard (RFC 3193). It is simply L2TP tunneled within IPSec. And if you are comfortable with Mac OS X command line, you are probably capable of using standard IPSec. It's just that VPN Tracker automates that for you with a very nice GUI.

(b) *"Therefore it's not compatible with most third party devices out there".*

That's because not all third party devices currently support L2TP-over-IPSec, but the number is increasing. L2TP is used by Microsoft, Cisco, CheckPoint and other vendors to allow remote users to obtain an IP address from the internal network. Plain IPSec cannot do that. I'm not saying that L2TP is the best solution (IKEv2 seems much more interesting) but it is a ratified standard and it is already supported by many clients and servers.

(c) *"VPN Tracker on the other hand with predefined connection types for the majority of VPN manufacturers and extensive interoperability how-to documents are available for most setups".*

In a perfect world you should not have different connection types for different vendors because all vendors would adhere to the same standard and implement it without interoperability issues. In practice, things are different. I have not used all third party devices supported by VPN Tracker but the ones I did test are generally compliant with the standards. Nevertheless, I think it is a big plus that VPN Tracker has identified remaining issues and provides ready-to-use configurations.

(d) *"A complete certificate management solution with built in CA features and an import/export that enables an easy rollout for enterprise scenarios".*

I think this feature is only in the Professional version of VPN Tracker and you won't need CA functionality if you only want to use it as a client and you have made your own provisions to generate your certificates. I must admit that from the screenshots it looks very nice.

<http://www.equinux.com/us/products/vpntracker/faq.html?cat=VPN-Tracker-FAQ#22>

The clients above all support plain IPSec (without L2TP) which has its advantages and disadvantages. There are also other VPN alternatives:

1. **Mac OS X supports PPTP.** This VPN protocol has its advantages and disadvantages, compared to L2TP/IPSec. In a nutshell, PPTP is not an official standard.

2. **Apani Mac OS X VPN Client:** Known to work with Nortel Network VPN Router (formerly Contivity). Status unknown with Openswan. Pricing and licensing terms not known to me; may not make such sense to use this client.

3. **Cisco VPN Client for Mac:** Uses IPSec with XAUTH (extended authentication) which is supported by only a few other vendors. XAUTH support is currently in development on Openswan. I do not know if this client will work with it, or the licensing terms of this client. It may not make financial sense to use the Cisco client with Openswan. The Cisco VPN client can only be downloaded from the Cisco website with a valid CCO user ID. You will need up-to-date versions of Mac OS X and the Cisco VPN client.

4. **CheckPoint SecureClient:** Status unknown with Openswan. Pricing and licensing terms not known to me. It may not make much sense to use this client.

5. **DigiTunnel** from Gracien is a PPTP client which has some extra features over the built-in Mac OS X PPTP client, such as split-routing (many companies consider this a security risk, though).

6. **OpenVPN** is an Open Source project with clients for Windows, Linux, Mac OS X, Solaris, etc.

References

- Openswan Wiki for more information on plain IPSec interoperability between Openswan and Mac OS X
<http://wiki.openswan.org/index.php/InteroperatingMac>
- IPSec-Tools
<http://ipsec-tools.sourceforge.net/>
- Special thanks to the author of Mac OS X hints.
<http://www.macosxhints.com/article.php?story=20031023144031331>
- Strongsec Documentation
http://www.strongsec.net/freeswan/install.htm#section_7.2



About The Author

Paul T. Ammann has been working in IT for almost 20 years now. He is happily married to his wife Eve for 7 years. He finds writing the author's bio the toughest part the article. He can be contacted at pammann@spymac.com.



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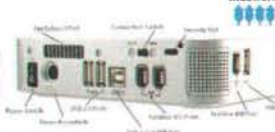
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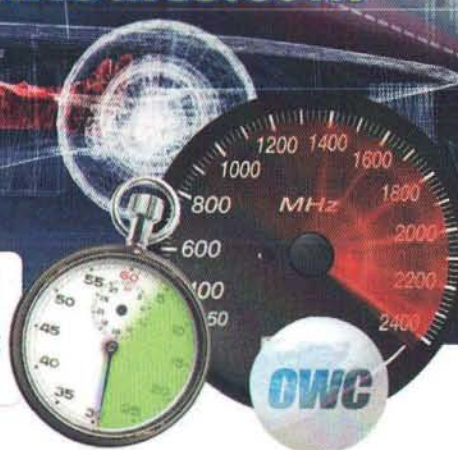
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